COAL AGE

Established 1911—McGraw-Hill Publishing Company, Inc.

DEVOTED TO THE OPERATING, TECHNICAL AND BUSINESS PROBLEMS OF THE COAL-MINING INDUSTRY

SYDNEY A. HALE, *Editor*

New York, June, 1933

In the Right Direction

RECOMMENDATION of Appalachian Coals, Inc., that its operating members increase wages ten per cent and action on that line last month by several producers in western Pennsylvania, the Harlan field and other districts are moves in the right direction. That such action also means increases in the mine prices of coal, particularly coal for industrial consumption, will be welcome relief from some of the scandalously low prices quoted in recent public bidding. Continued pauperization of the coal operator and the coal miner that other industry may be fueled at prices which have no relation to reasonable costs at a living wage for coal-mine capital and labor is sound neither socially nor economically. No consumer conscious of the interdependence of all industry can demand such starvation prices without directly or indirectly jeopardizing his own business future.

"The New Deal" in Industry

RAGGED SURVIVORS of the school of rugged individualism will find no comfort in the National Industrial Recovery bill introduced in Congress last month. Business is given the initiative in self-regulation with exemption from the restrictions of the anti-trust laws where the cooperative action taken is approved by the government. Back of this qualified freedom, however, lie provisions empowering the President to prescribe codes of fair competition where business is coy or its codes fail to win federal indorsement and to set up a licensing system. And the shadow of compulsory unionization is cast over the open shop.

Since the provisions for self-regulation follow the suggestions made by organized industry in opposing the 30-hour bill, organized industry can hardly attack those provisions now. Complaints that the licensing power, declared by the President necessary "to meet rare cases of non-cooperation and abuse," is too drastic are not impressive. Opposition finds its greatest rallying ground in the labor provisions of the bill, and this opposition gains by the announcement that the American Federation of Labor plans a new organization drive.

There is validity in the criticism that the labor provisions should not be unilateral. Clarification of phraseology to make this clear and also to preserve unimpaired the rights of workers who prefer to deal directly with their employers is highly desirable. But to hope for the elimination of the labor sections would be naïve beyond understanding. One inescapable prerequisite to recovery is to put a bottom on wages. Moreover, as President Roosevelt stated in his radio talk May 7, the administration does not want to see wages lag behind the increase in commodity prices which the administration is promoting.

Unless it be assumed that Washington is joining hands with organized labor in compulsory unionization, the bill should give enlightened open-shop employers an opportunity to strengthen their position. With the persistent wage slasher forced by government mandate into agreement with his more socially minded competitors, the open-shop employer will be able to pledge his workers a wage stability impossible of maintenance under existing conditions. Such a pledge will rob the union organizer of much of his persuasiveness.

Rugged individualism has had a glorious tradition which, emotionally, it is not easy to abandon. Yet even the most enthusiastic exponents of this tradition must admit that cherished social and economic standards have broken down under the impact of the industrial depression. Unfortunately, there seems little

For Table of Contents of this issue see page 220

reason to believe that these can be built back as rapidly as national necessities demand without the government support and sanctions implied in this bill.

Certainly the bill gives the trade association a new status and a new influence as an instrument for self-government. The manner in which these organizations exercise these new powers will largely determine the position business and industry shall enjoy when the emergency period is history. To coal men in particular, enactment of this bill takes on a special significance, since it promises indefinite postponement of administration proposals for legislation regulating the mining industry.

Groundless Fears

BECAUSE the National Industrial Recovery bill was submitted to Congress as part of the administration's "national campaign to put people to work," some business men have voiced the opinion that its enactment will militate against expenditures in the capital-goods field for cost-reducing equipment. The effect should be just the opposite. Washington is definitely committed to a program to increase wages and to reduce the hours of labor; in the public works section of the bill and in other less patent indications, the administration makes it plain that direct stimulation of activity in capital-goods industries is counted upon as a major factor in a revival of profitable employment for capital and labor.

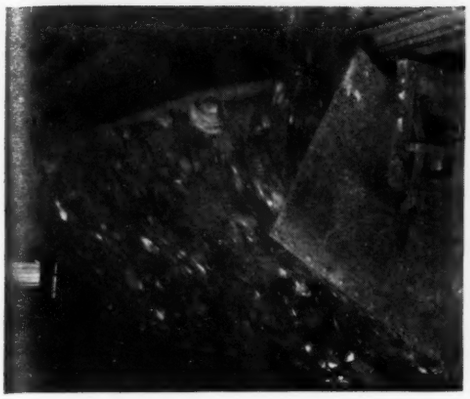
Higher wages, shorter working hours, widespread employment and adequate profits for capital can be sustained only when commodity prices are at levels which permit the rapid absorption of the products of industry into the buying stream. This combination inevitably means the junking of obsolete equipment and methods and the greater use of modern tools for efficient, low-cost production. One of the most discouraging things progressive management has faced in the past three years has been the diminution of the advantages of modernization through unrestricted wage competition. By putting a bottom on wages, the incentive to increase both wages and profits through modernization is restored.

At the end of 1932, industry, based on average expenditures for 1919 to 1929, was $30,000,000,000 behind in its purchases of new equipment and investments for new plant facilities; over 76 per cent of this total represented deferred replacement of obsolete equipment. Obviously, any campaign to reestablish industrial activity that did not take this situation into account would fall short of its objective. If the nation has learned one lesson since 1929, it is a keener appreciation of the close interdependence of all industry. Without revival in the capital-goods industries, employment opportunities in the consuming and service industries must, as they have been doing, shrink and dry up.

Care in Stemming

INVESTIGATIONS made by Dr. Beyling, of Germany, have shown why short-flame permissible explosives occasionally ignite gas and dust when the hole is not properly stemmed. Lead plates were mounted in front of an unstemmed hole and their deformation was measured after the shot had been fired. Apparently the force of the shot was insufficient to cause ignition of firedamp by the direct concussion and compression of the air, but it was found that the lead received certain incrustations of more or less undecomposed particles of explosive. By suspending cartridges and firing them, and shooting cartridges in pure oxygen, he found similar undecomposed particles resulted. During their escape from a shothole these imperfectly burned particles may be deflagrated by the pressure resulting from the progressive detonation of the charge, if they are not already incandescent, and when they are driven beyond the limits of the fume cloud, or into a gaseous atmosphere, they may burn and ignite the gas, especially when one or more cartridges have been placed between the detonator and the mouth of the hole. A short hole with a short stemming is more likely to cause an explosion than a longer hole more heavily loaded, for the particles will be more likely to be consumed before they reach the atmosphere. If the explosive is easily detonated, as are gelatinous explosives, the greater the danger.

Care in stemming the hole, both as to tightness and length, is therefore essential, even when the charge in the hole is small. One cannot be assured that a shot will be safe, however small, if the stemming is inadequate to permit the escape of undecomposed particles, no matter how short may be the flame which the explosion generates.



New Car Ready to Dump

LOADER EFFICIENCY

+ Increased by Installing Big Cars

At Fairpoint Mine

By P. R. PAULICK

Engineer, Hanna Coal Co.
St. Clairsville, Ohio

WITH the installation of 5-ton mine cars, revision of haulage schedules, and the installation of a 200-ton storage bin to take up the slack between preparation-plant capacity and mine output, the Hanna Coal Co. has completed the last of the major phases of its modernization program at the No. 9 mine, Fairpoint, Ohio. Hanna long ago committed itself to a continuous and progressive program of improvements at its mines, using the Fairpoint operation as a laboratory. By March, 1931, after about one year of intensive effort, mechanization of the mine was satisfactorily accomplished from the standpoint of coordination and standardization of cutting, drilling and loading underground, and preparation on the surface.

Coal is cut by universal-type track-mounted Oldroyd cutters. Jeffrey A-6 post-type drills are used in entries and "Little Giant" post drills are used in rooms. Loading is done by Myers-Whaley No. 3 Automat loaders. Six-ton, 49-cell Ironton battery locomotives are used for gathering and the coal is prepared in a modern plant equipped with a Link-Belt-Simon-Carves washer.

But the management was convinced that other avenues of improvement were yet to be explored, and selected transportation as the one big opportunity remaining. Track needed no improvement, as it had been the first point of attack. Main haulage roads were laid with 60- and 40-lb. rail on steel ties with $\frac{3}{4}$-in. crushed limestone ballast, and 30-lb. rail on steel ties was laid in the rooms. The remaining weakness in transportation was believed to lie in the use of 2-ton wooden cars equipped with ordinary link-and-pin couplings.

As a first step in testing out the expected benefits of larger equipment, the management obtained thirteen cars holding 3.4 tons from another operation. These cars were used for several months while time studies were made on all operations (loading, gathering, transportation and dumping) in which the cars figured. Similar studies were made with the 2-ton cars.

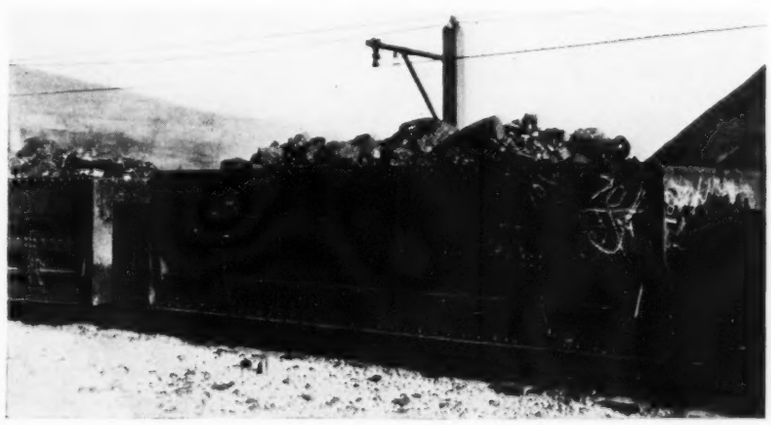
Using the information obtained in these studies, time-study set-ups were made for the loading units using the 2-ton and 3.4-ton cars. Additional set-ups were made for the mine as whole, using each type of car. Analysis showed that the 3.4-ton car was 13 per cent more efficient than the two-ton car. Not satisfied with these results, the management decided to go a step further and determine the efficiency increase that could be expected when using a 5-ton car. A theoretical set-up, based on the studies made with the two smaller cars, showed that with the 5-ton car the efficiency of the loading units could be increased 21 per cent over that obtained with the 2-ton cars.

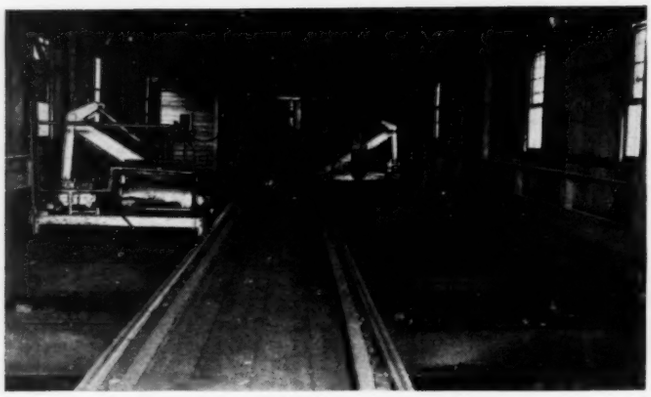
On the strength of these findings, sixteen 5-ton cars of a design new to coal mining were purchased. Check studies proved that the basic set-up was correct, and led to the complete replacement of 275 old cars with 93 of the new type. With the 5-ton cars, the expected mine-wide efficiency increase of 21 per cent has been realized, and the productivity of the loading units in wide places (now 400 tons per shift) has been raised 29 per cent.

The seam mined at Fairpoint is 5 ft. thick and is overlaid with 12 in. of slate which frequently comes down with the coal; unless it does, it must be taken down after each cut of coal is loaded out. Rooms on 30-ft. centers are turned at an angle of 45 deg. with the entry. After being necked 8.5 ft. wide, they are widened to 22 ft. and are driven to a depth of 308 ft. Three methods of working are employed: (1) wide work, twelve rooms per loading unit, all in one block (*Coal Age*, April, 1931, p. 170); (2) entry work, consisting of two to seven entries per loading unit, depending upon the type of development (*Coal Age*, March, 1932, p. 95); and (3) combination work, employing one loading unit in a section consisting of two entries and eight rooms. Five loading units are in service, as follows: wide work, two; combination work, two; entry work, one. A loading unit consists of a loader, cutting and shearing machine, drill and gathering locomotive.

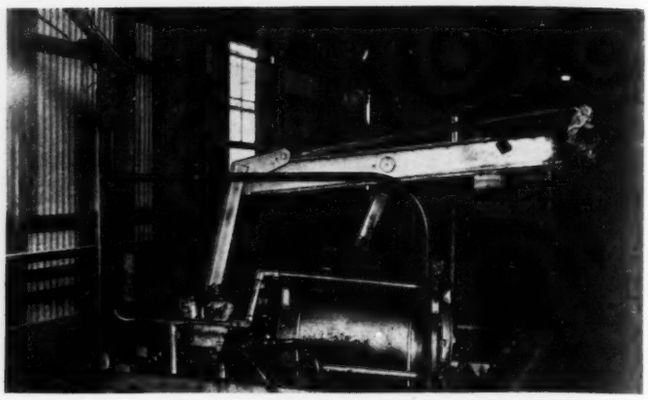
In the preliminary planning for installation of the 5-ton cars, it was de-

New Car After Being Loaded Mechanically. This View Shows Taut Trolley Wire and Signal Lines





General View of Bin Showing Arrangement of Track and Location of Movable Dumping Trucks



Dumping Truck Showing Small Cylinder Extended and Dumping Arm in Final Position

termined from the time studies that each loader on wide work and combination work would require 18 cars, and that the loader on entry work would need four cars, or a total of 76 for the five loading units. To this number were added eight cars for slate handling, three for shop replacements, and six for additional coal storage in case it should be decided to operate the preparation plant 10 hours instead of 9, as at present, making a total of 93 cars.

Operation of main haulage locomotives is strictly scheduled. The capacity of the preparation plant is 1,530 tons in nine hours, and this figure has been set as the standard production for the loading units in eight hours, making the adoption of predetermined scheduling of haulage imperative if the flow of coal is to be maintained to allow the preparation plant to operate at capacity during the shift, and for an extra hour afterward.

Two main-line locomotives and one relay or pick-up locomotive comprise the rolling stock used in main haulage at No. 9 mine. Four men—three motormen and one brakeman—operate this equipment and haul approximately 1,500 tons in eight hours. Main-line locomotive No. 1 serves a section in which one entry and one combination loading unit are at work. This locomotive is scheduled to gather a trip of eight to ten cars of coal from the two loading units, plus any slate cars loaded on the section, haul the trip a distance of 11,000 ft. to the outside, wait for the trip to be dumped, and return to the section in 34 minutes.

Trips handled by main-line locomotive No. 2 are pulled from the second section by the pick-up locomotive, which places them on the Passway 9,500 ft. from the outside. The pick-up locomotive then returns to the section with an empty trip. No. 2 locomotive handles 15- or 16-car trips, and makes the round trip between the Passway and the outside in 33 minutes. This schedule gives the pick-up locomotive ample time to place empties for the three loading units on this section, assemble a loaded trip, and return to the Passway while the main-line locomotive is making a trip to the outside.

The new 5-ton car on which the transportation system is based was designed by R. S. Walker, consulting engineer, M. A. Hanna Co., and is manufactured by the Differential Steel Car Co. Large capacity coupled with easy handling at the face and in transit were objectives in design. General features include all-steel construction, ability to dump to either side, and four-wheel trucks. The car dumps to either side with equal ease. During the dumping operation, the body of the car, which rests on a trunnion arrangement mounted on the chassis, is tilted sidewise by compressed-air-plunger dump truck, shown in the accompanying illustrations. Both side doors are hinged at the floor line, and as the car body is raised, the door on the dumping side folds down into the plane of the floor. The open door therefore serves as an extension or chute over which the coal flows into the dump. After dumping, the car body returns to running position by gravity, and the open door is simultaneously closed and locked. The locking arrangement prevents accidental opening while the car is in transit.

Capacity of the car level full is 160 cu.ft. and the average tonnage carried when loaded by machines is 4.75. Height is only 42 in., and other principal dimensions are: over-all length, 14 ft. 8½ in.; inside length, 12 ft. 8 in. at the top and 12 ft. at the bottom; over-all width, 5 ft. 7 in.; inside width, 5 ft. 5 in. at the top and 4 ft. 11 in. at the bottom.

The most striking difference between conventional types of mine cars and those used at No. 9 mine is the use of eight wheels, or two four-wheel trucks. Wheel diameter is 10 in., and the distance between wheel centers on a single truck is 24 in. Trucks are spaced 8 ft. apart on the body of the car. The floor of the 5-ton car is reinforced with lateral beams; doors are of double-plate construction; and high-grade steel castings are employed. Timken tapered roller bearings are used in the wheels, and Willison automatic couplers (National Malleable & Steel Castings Co.) are standard. A brake and uncoupling handle are mounted on either end.

Though of large capacity, these cars are easily handled at the face and in transit. Flexibility while coupled together in trips is high, and no difficulty is experienced on curves as small as 28-ft. radius. This is due to the use of two trucks, in each of which the wheelbase is short. Because of the easy riding qualities and stability on the track, swaying is minimized. Spillage in transit is thereby greatly reduced.

It is a well-known fact that the operation of any mine is intermittent, especially in the morning hours. The logical way to eliminate any delays which might result from this intermittent operation is to install a storage bin of sufficient capacity to take up the slack between the mine and preparation plant. Consequently, it was decided when the new cars were installed at No. 9 to build a 200-ton bin to operate the preparation plant during the slack morning hours, to supply coal for the extra hour of preparation-plant operation, and to hold any excess which might be left after the end of the surface shift.

The bin installed at No. 9 is 60 ft. long and has a clear dumping length of 56½ ft., sufficient to allow for spotting and dumping three cars at a time. Cars come in on a track over the center of the bin, as shown in the accompanying illustrations, and the space between the rails and the sides of the bin is 9 ft., sufficient to allow dumping at will. Cars are never uncoupled during dumping. The locomotive is left coupled to the trip, and as soon as three cars are dumped it pulls up a sufficient distance to place three more in position. Slate cars are dumped into a second bin 30 ft. away from the coal bin. The slate bin is equipped with its own dumping mechanism. Stop lights are provided for controlling spotting when the motorman is out of sight of the dumper.

The dumping mechanism at the slate bin is stationary, and each car is spotted and dumped separately. Two movable

(Turn to page 186)

SAFETY WORK

+ A Paying Proposition

At Madeira, Hill & Co. Collieries

WITH more than ten years of steady plugging on safety culminating in a production per fatality double that of the average for the entire anthracite region in 1932, and in the award of a Joseph A. Holmes Safety Association Certificate of Merit to the Colonial colliery, the anthracite operations of Madeira, Hill & Co., at Natalie, Shenandoah, Morea Colliery and Mahanoy Plane, Pa., offer still another affirmative answer to the question "Does safety pay?" During 1932, the four collieries of this company (Colonial, Kehley's Run, Morea and Lawrence) shipped an average of 417,612 gross tons per fatality, slightly more than double the average of 204,552 tons for the hard-coal region as a whole. One colliery, Colonial, shipped 567,900 tons per fatality and took third place among the anthracite operations.

In the last five years, the company raised its shipments per fatality (Table I) from a low of 217,993 tons (1931) to last year's average of 417,612 tons. Fatalities at the seven mines totaled three in 1932, less than half the total for the next lowest of the preceding four years. At the same time, compensable personal injuries—that is, injuries of more than seven days' duration—were reduced to 185 in 1932, against 249 in the previous year and 336 in 1928. While this reduction was due in part to a decrease in working time and men employed, examination of the figures on tons shipped per compensable injury (Table I) shows an appreciable gain over and above that resulting from cuts in operating force and working time. In 1932, the figure was 6,772 tons per compensable injury, an increase of 19.2 per cent over the 1928 total of 5,645 tons. This article covers only the results achieved in the past five years at the operations of this company; thus, the 1932 record represents even larger gains over earlier years.

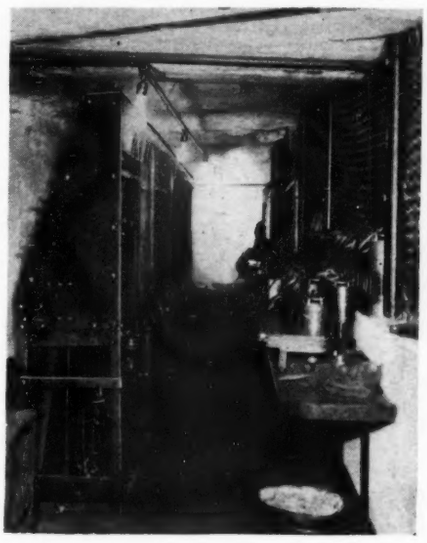
Safety work at Madeira, Hill & Co. collieries heads up in the safety engineer,

Table I—Production of Coal Per Compensable Injury and Per Fatality at Madeira, Hill & Co. Collieries

	Fatalities		Compensable Injuries (Over 7 Days)	
	Number	Tons Shipped per Fatality	Number	Tons Shipped per Injury
1928.....	7	270,978	336	5,645
1929.....	9	255,489	281	6,364
1930.....	7	226,993	323	5,544
1931.....	7	217,993	249	6,128
1932.....	3	417,612	185	6,772

William Richards, mining engineer and formerly mine inspector for the Ocean Accident & Guarantee Corporation. In addition to directing safety work, investigating serious injuries and fatalities, and inspecting properties, the safety engineer is charged with the duties of keeping records, formulating safety policies and adopting safety methods and equipment. Formulation of policies, development of methods and adoption of safety equipment, however, are done in cooperation with the operating department. Once each month, the safety engineer meets with the general manager, the colliery superintendents and the heads of the various service departments. In these meetings, past accidents are analyzed and all the interested parties have a chance to air their views on the remedies proposed. As a result, the safety methods, policies and equipment approved at these meetings are acceptable to all, and therefore are more likely to produce results.

One Weapon in the War on Gas Explosions; Underground Station for Electric Cap Lamps, Colonial Colliery.



Once a decision is made on policies, methods or equipment, putting it into effect becomes a task of those officials in direct charge of the men. These officials (foremen, electricians, mechanics and others, both inside and outside) meet with the superintendent or appropriate department head at least once a month — usually oftener — to discuss their records, receive the latest decisions and consider the best means of putting them into effect.

While physical safeguards are an important part of the Madeira, Hill & Co. safety work, man-failure is recognized as the most vital factor in personal injuries. Consequently, the safety efforts of these officials are primarily educational and are largely a matter of personal contact between the employee and his immediate supervisor. One outstanding feature of the educational program is the fact that it is carried on continuously by all officials whose work at any time brings them in contact with the men. Its major objective, naturally, is the fostering of safe working methods, though a hardly less important purpose is the establishment of the safety habit so firmly that doing an unsafe act requires a distinct mental effort.

While the most of the educational work is a matter of personal contact, an opportunity for mass instruction is afforded at the Colonial colliery, where a Holmes safety chapter meets once a month. In addition, the safety engineer and the first-aid and mine-rescue teams at each colliery receive instruction in safety work at regular intervals. Supplementing the other educational methods are bulletins dealing with injuries, their causes and prevention.

The success of the educational work

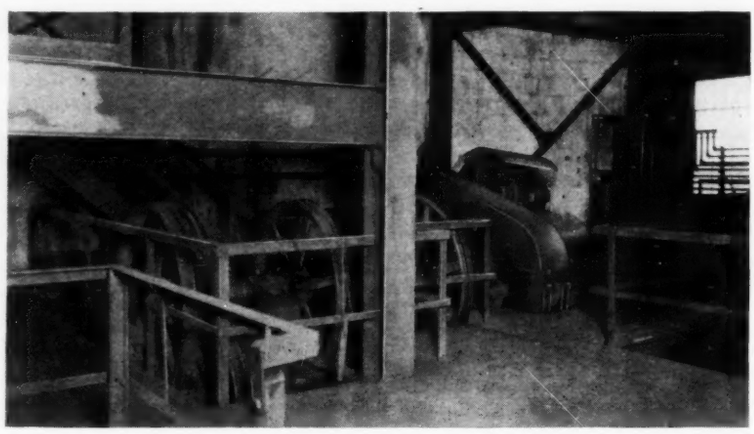
may be judged from the decrease in certain classes of injuries, of which "falling persons" is one. While it is possible to eliminate some of the physical hazards which contribute to this class of injuries (clean places and illuminated haulage roads and traveling ways are insisted on, for instance), others can be minimized only through carefulness. As an example, slipping on sheet iron or on the bottom causes a large number of injuries appearing in the falling persons list. By constantly cautioning the men against this danger, the number of injuries from slipping has been reduced materially. Similar methods are employed in combating other causes of falls of persons, with the result that the number of injuries from this cause has shown a steady decline (see Table II).

Handling coal and rock or materials offers another example of the difficulties in the prevention of accidents through the use of physical safeguards, though finger and hand injuries arising out of these activities are being reduced by the use of gloves. Strained backs and muscular damage and other injuries resulting from this cause, however, are a personal problem, and can be avoided only by knowing how to lift and handle heavy or bulky materials. Imparting this knowledge is a function of the supervisory force under the direction of the safety engineer. The results have been worth while, as indicated in Table II. Further evidence in support of the value of educational work is given in Table III, which shows, for example, material declines in back, side and leg injuries, for which ordinarily it is difficult to provide physical safeguards.

To make an educational program really effective, the routine production work of the supervisors must not be so burdensome as to prevent them from devoting the necessary time to instructing each man in their charge. This fact is recognized by the company, and as a result the number of employees under each supervisor has been reduced gradually in late years by retaining all supervisors in the face of a decrease in working force to compensate for the reduced demand for coal. The process, however, will not be reversed when more normal times return; in that event, more men will be added to the supervisory force.

The material reduction in both fatal and non-fatal injuries in 1932 arose out of improvements in practically all classes of accidents, as shown in Table II. Examination of the record, however, reveals outstanding gains in certain classes in addition to those discussed above, notably those resulting from falls of roof, machinery, gas explosions and transportation, also in injuries to the head, hand and eye. One of the most striking items in the 1932 record was the reduction of injuries due to gas explosions to zero, due primarily to educational work designed to eradicate carelessness on the part of the miner, electric firing of shots, improvements in ventilation and the use of electric cap lamps.

In 1932, the company had in service in gaseous sections in three of its collieries 1,337 electric cap lamps out of a total of 1,479 on hand. The fourth colliery is non-gaseous. The difference between the number of lamps in service and on hand is due to the fact that the working force was reduced at one colliery which had been fully equipped; the extra lamps at this colliery are being transferred to the other two operations. Both Wheat and Edison lamps are used, one station being equipped with 62 of the former and the remainder with Edison models. Table IV shows the relation between the number of men employed underground, cap lamps in service, gas explosions, men injured or killed in these explosions and compensation cost for each of the five years 1928-32. It will be noted that smoking in violation of the anthracite mining law was one of the principal causes of gas explosions. Strict supervision and continuous educational work are practically the only safeguards against violations of this nature.



Protecting the Surface Worker; Open Guards in Colonial Breaker.

Increased supervision and educational work also are given credit for much of the reduction in fatal and non-fatal injuries arising out of falls of roof and falls of face or rib, two of the most difficult of all mining hazards to cope with. As a result of these activities, plus the use of protective headgear, which will be discussed more fully in later paragraphs, the number of injuries and deaths from these causes was cut to 35 in 1932, a reduction of 63 per cent from the 1928 total of 92.

Transportation hazards offer a problem scarcely less difficult than falls of roof or face, but experience at the Madeira, Hill & Co. collieries is evidence that they can be reduced materially. In 1932, cars and locomotives accounted for 23 lost-time injuries of more than one day's duration, but no fatalities, a reduction of 75 per cent from the 1928 record of 93 injuries. Education again played an important part in the gain, supplementing elaborate physical safeguards. All haulage roads in Madeira, Hill & Co. collieries are electrically lighted, several are equipped with block signals and, where possible, automatic doors. Trip lights are universally used, and

Table II—Fatal and Non-Fatal Accidents at Madeira, Hill & Co. Collieries, by Causes, 1928-32

Cause	1928		1929		1930		1931		1932	
	Fatal	Non-Fatal	Fatal	Non-Fatal	Fatal	Non-Fatal	Fatal	Non-Fatal	Fatal	Non-Fatal
Fall of roof—rock or slate, fall of coal face or rib	1	91	1	87	4	81	2	50	1	34
Falling objects	..	1	1	7	..	11	..	14	1	14
Falling persons	1	65	2	67	..	79	2	65	..	46
Handling coal or rock	..	96	..	69	..	59	..	33	..	26
Handling material — timber, etc.	..	66	..	72	..	62	..	37	..	33
Rush of falling coal, chute-manways	2	25	..	48	2	78	..	46	1	28
Flying material — small particles	..	19	..	24	..	23	..	11	..	11
Flying objects — steel chips, etc.	..	4	..	..	..	4	..	2	..	..
Cars and locomotives	..	93	2	63	..	50	3	25	..	23
Mechanical loading	..	..	..	4	..	3	..	8	..	4
Animals — mules and horses	1	12	..	11	..	5	..	4	..	5
Caught in machinery, etc.	..	13	1	5	..	3	..	7	..	4
Electrical shock, burn	..	2	..	1	..	2	..	1	..	1
Explosives, shooting, fumes	1	4	1	9	1	13	..	2	..	2
Gas explosion	..	19	1	6	..	7	..	8	..	..
Carbide explosion, burn	..	4	..	1	..	..	..	1	..	1
Stepping on nails	..	12	..	12	..	9	..	11	..	11
Tools — general use	..	30	..	26	..	27	..	20	..	26
Not classified	1	14	..	22	..	17	..	12	..	3
Total	7	570	9	534	7	533	7	357	3	272

alarms are installed for the protection of walkers. Motive equipment and track are maintained in good condition, and steel cars equipped with roller bearings are in the majority. All wood cars now in use are being eliminated gradually.

Surface plants have not been neglected in the company's safety program, as shown by the figures on injuries caused by contact with machinery. Only four lost-time injuries from this cause occurred in 1932, due to educational work and the universal use of guards, which are of two types: the conventional inclosed guard and the open guard, a feature of the Colonial breaker. The Colonial guards, an example of which is shown in an accompanying illustration, consist of railings around all moving equipment, which serve the double purpose of preventing accidental contact and facilitating inspection and repairs.

Table III—Location of Injuries Causing Fatalities and Lost Time

	1928	1929	1930	1931	1932
Head	56	41	38	13	11
Face	25	16	27	25	16
Eye	32	29	31	18	18
Chest	4	12	7	8	1
Back	76	76	50	41	39
Side	40	29	37	27	14
Abdomen	3	2	2	6	4
Arm	54	48	52	36	22
Hand	30	46	48	30	17
Fingers	75	80	84	63	51
Leg	113	90	100	51	52
Foot	49	52	42	31	20
Toes	17	9	15	9	10
Not Classified	3	13	7	6	..
Total	577	543	540	364	27

Where possible, the company advocates the use of protective clothing to prevent injuries, and experience to date, coupled with the various educational measures adopted, has shown a gratifying reduction in head, hand and eye injuries through the use of protective headgear, gloves and goggles. The question of cost and suitability to conditions at the various collieries has slowed up the introduction of safety footgear, but 72 pairs of boots and 12 pairs of shoes were in service in March, with more contemplated for the future.

Protective headgear was first introduced in Madeira, Hill & Co. mines in 1929, and in that year 240 safety hats were distributed among the 2,325 men employed underground at the four collieries, as shown in Table V. A total of 693 days were lost due to 126 head injuries, and the compensation and medical cost of head injuries was $7,964.70. The company standardized on the M-S-A Skullgard in 1931, and in 1932, with 1,822 out of the 1,898 men employed underground so equipped, the days lost due to eleven head injuries totaled 76, while compensation and medical cost was $295. Between 1928 and 1932, tons shipped per head injury rose from 10,775 to 113,894.

Due to the use of goggles, guards on emery wheels and the education of workmen in safe operating methods, eye injuries were reduced from 32 in 1928 to 18 in 1932, a decrease of 43 per cent. The prevalence of eye injuries in shops long ago led officials to insist on screen-type goggles, which were furnished by the company. Beginning in 1932, however, due to the encouragement of the safety engineer and operating officials, there was a major increase in their adoption for other work, both on the surface and underground. The movement took on added impetus early in 1933, with the result that 350 pairs were in use in March. Except for the screen-type goggles used by the shopmen, the majority are of the spectacle type, furnished by the Willson Products Co.

Employees are urged to wear goggles when picking coal, chipping rivets or bolts or engaging in any other activity resulting in flying material, although their use is not compulsory, officials contenting themselves with pointing out the benefits and setting the example. A similar attitude characterizes all the safety work, the company proceeding on the theory that preparing the ground by proper education and example is preferable to safety by fiat. Consequently, disciplinary measures are used sparingly, though violators of the mining laws are subject to lay-off and separation from the payroll.

Instruction in the proper method of handling materials and the use of gloves are credited with the major part of the reduction in hand and finger injuries. These injuries resulted in 105 lost-time accidents in 1928 and 68 in 1932, a reduction of 35 per cent. Canvas gloves are in the majority, the miners preferring them because of their low cost, in spite of the fact that their life is short.

Table IV—Five-Year Record of Injuries From Gas Explosions at Madeira, Hill & Co. Collieries

	Colliery Number				
1928	1	2	3	4	Total
Employees underground	975	535	515	254	2,279
Electric cap lamps in use	380	160	62	....	602
Gas explosions	4	7	....	....	11
Men burned	7	11	....	....	18
Compensation cost	$195.00	$886.00	....	....	$1 081.00
1929					
Employees underground	986	527	574	238	2,325
Electric cap lamps in use	580	510	74	....	1,164
Gas explosions	....	2	....	....	2
Men burned	....	3	....	....	3
Compensation cost	....	$7,622.42	....	....	$7,622.42
1930					
Employees underground	947	449	531	219	2,146
Electric cap lamps in use	720	449	164	....	*1,409
Gas explosions	1	2	1	....	4
Men burned	2	3	2	....	7
Compensation cost	$660.00	$1,183.52	$1,983.00	....	$3,826.52
1931					
Employees underground	979	445	479	212	2,115
Electric cap lamps in use	720	445	234	....	*1,479
Gas explosions	2	1	1	....	4
Men burned	3	3	2	....	8
Compensation cost	$1,095.14	$346.00	$297.86	....	$3,095.00
1932					
Employees underground	992	383	339	184	1,898
Electric cap lamps in use	720	383	234	....	*1,479
Gas explosions	....	....	....	....	....
Men burned	....	....	....	....	....
Compensation cost	....	....	....	....	....

*Total number of lamps on hand.

Number of explosions and men burned due to smoking in violation of the anthracite mining laws were as follows: 1928, seven explosions, eight men injured; 1929, one explosion, one man; 1930, three explosions, three men; 1931, two explosions, three men

Table V—Four-Year Record of Reduction in Compensation Cost for Head Injuries Underground at Madeira, Hill & Co. Collieries

	Colliery Number				
1929	1	2	3	4	Total
Employees underground	986	527	574	238	2,325
Protective caps in use	43	48	53	96	240
Head injuries underground	38	28	37	23	126
Days lost due to head injuries	286	67	290	50	693
Compensation and medical cost	$583.22	$6,659.59	$608.28	$113.61	$7,964.70
Tons shipped per head injury	....	....	....	....	14,193
1930					
Employees underground	947	449	531	219	2,146
Protective caps in use	60	80	63	124	327
Head injuries	37	32	59	14	142
Days lost	716	267	285	51	1,319
Compensation and medical cost	$3,631.70	$783.71	$646.26	$184.00	$5,245.67
Tons shipped per head injury	....	....	....	....	11,908
1931					
Employees underground	979	445	479	212	2,115
Protective caps in use	970	443	202	212	1,827
Head injuries	11	1	15	1	28
Days lost	19	....	104	....	123
Compensation and medical cost	$33.86	$13.00	$418.28	$4.00	$469.14
Tons shipped per head injury	....	....	....	....	54,498
1932					
Employees underground	992	383	339	184	1,898
Protective caps in use	992	383	263	184	1,822
Head injuries	....	....	11	....	11
Days lost	....	....	76	....	76
Compensation and medical cost	....	....	$295.00	....	$295.00
Tons shipped per head injury	....	....	....	....	113,894

NATIONAL COAL ASSOCIATION · PROGRAM

Come to Chicago!

AS CHAIRMAN of the Chicago Committee for the 14th Annual Meeting of the National Coal Association and upon behalf of my associates, I urge all coal men to attend that meeting—Drake Hotel, Chicago, June 15-16-17.

In ordinary times we should emphasize the Century of Progress Exposition and talk about the program we have arranged for Saturday, June 17, "Coal Day" at the Exposition. These are extraordinary times, the industry-control bill is in the spotlight.

Opposite is the full program of the meeting—a well-balanced program, which will be productive of practical help to every coal man.

But of transcendental importance will be consideration at the meeting of the industry-control measure. Because it vitally concerns your indvidual business, the Chicago Committee believes you will avail yourself of the opportunity afforded by this meeting of your industry to participate in the discussion.

Every coal man is welcome. All should be there.

Yours for our industry,

George B. Harrington

Chairman, Chicago Convention Committee
National Coal Association

THURSDAY • JUNE 15

Morning Session—9:30 O'clock

CHAIRMAN—J. W. SEARLES, President, Pennsylvania Coal & Coke Corporation, New York City.

Call to order by president and announcement of committee appointments.

Introduction of presiding officer.

Address by President C. E. BOCKUS.

Report of the treasurer, W. D. ORD.

Report of the executive secretary, CARROLL B. HUNTRESS.

Report of government relations committee,
CHARLES O'NEILL, vice-president, Peale, Peacock & Kerr, Inc., New York City, chairman.

"THE REGIONAL SALES AGENCY PLAN AND RELATED LEGISLATION."

JAMES D. FRANCIS, vice-president, Island Creek Coal Co., Huntington, W. Va., and president, Appalachian Coals, Inc.

HARRY L. FINDLAY, vice-president, Youghiogheny & Ohio Coal Co., Cleveland, Ohio, and chairman, organization committee, Northern Coals, Inc.

FOURTEENTH ANNUAL CONVENTION · 1933

· DRAKE HOTEL · CHICAGO · JUNE 15-17

THURSDAY—Continued

Luncheon and annual meeting, Committee of Ten, 12.15 p.m., Rooms F and G.

Luncheon meeting, Nominations and Elections Committee, 1 p.m., Room B.

Luncheon meeting, Resolutions Committee, 1 p.m., Room D.

Afternoon Session—2:30 O'clock

CHAIRMAN—R. H. KNODE, President, Stonega Coke & Coal Co., Philadelphia, Pa.

"COMMERCIAL AND TECHNICAL RESEARCH IN BITUMINOUS COAL."
JOHN C. COSGROVE, president, West Virginia Coal & Coke Corporation, Johnstown, Pa.

"WHAT RESEARCH HAS DONE FOR INDUSTRY."
JOSEPH H. FRANTZ, president, Board of Trustees, Battelle Memorial Institute, Columbus, Ohio.

A. C. WILLARD, professor, Heating and Ventilation, and Head of Department of Mechanical Engineering, University of Illinois.

F. H. DANIELS, president, Pulverized Fuel Equipment Association; treasurer, Stoker Manufacturers' Association, and president, Riley Stoker Corporation, Worcester, Mass.

ARTHUR HEWITT, president, American Gas Association, Toronto, Canada.

Dinner meeting of district association secretaries, 6.30 p.m., Room B.

FRIDAY • JUNE 16

Morning Session—9:30 O'clock

CHAIRMAN—W. J. JENKINS, president, Consolidated Coal Co. of St. Louis, and president, Illinois Coal Operators' Association, Chicago, Ill.

Report of Committee on Nominations of Directors at Large and on Elections of District and State Directors.

"FUEL DISTRIBUTION"
G. D. COWIN, president, Bell & Zoller Coal & Mining Co., Chicago.

G. C. DAVIS, manager, Stag Canon Branch, Phelps Dodge Corporation, Dawson, N. M.

W. A. RICHARDS, president, Sovereign Pocahontas Co., Bluefield, W. Va.

J. NOBLE SNIDER, general manager of sales, Consolidation Coal Co., New York City.

R. C. HOLMES, former chairman of the board, The Texas Co., New York City.

FRIDAY—Continued

"CREDIT PROTECTION"
W. J. MAGEE, vice-president, Carbon Fuel Co., and president National Coal Credit Corporation, Cincinnati, Ohio.

District Association Luncheon meeting, 1 p.m., Tower Room.

CHAIRMAN—R. H. SHERWOOD, chairman of the board, Coal Trade Association of Indiana, Indianapolis, Ind.

Discussion led by WM. G. CAPERTON, member executive committee, New River Coal Operators' Association, and president, Smokeless Coal Operators' Association of West Virginia, Charleston, W. Va.

Sectional meeting, 2.45 p.m., Lantern Room.

"COAL CREDITS"—Under auspices National Coal Credit Corporation.

Afternoon Session, 2:45 O'clock

CHAIRMAN—IRA CLEMENS, president, Commercial Fuel Co., Pittsburg, Kan.

Report of Committee on Resolutions.

"SAFETY."
MILTON H. FIES, vice-president, DeBardeleben Coal Corporation, Birmingham, Ala.

Discussion led by OTTO HERRES, assistant manager, U. S. Fuel Co., Salt Lake City, Utah.

E. J. NEWBAKER, vice-president and general manager, Berwind-White Coal Mining Co., Windber, Pa.

L. E. YOUNG, vice-president, Pittsburgh Coal Co., Pittsburgh, Pa.

"WORKMEN'S COMPENSATION."
THURLOW G. ESSINGTON, Chicago, Counsel, Illinois Coal Operators' Labor Association.

Open Forum

Directors' Meeting, 4 p.m., Room C.

Annual Dinner, 7.30 p.m., Gold Coast Restaurant.

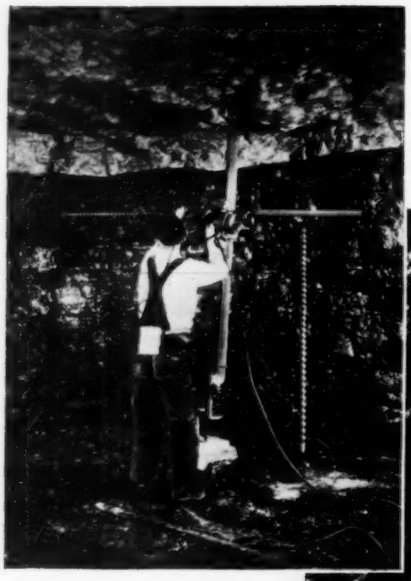
Toastmaster, HUGH MORROW, president, Sloss-Sheffield Steel & Iron Co., Birmingham, Ala.

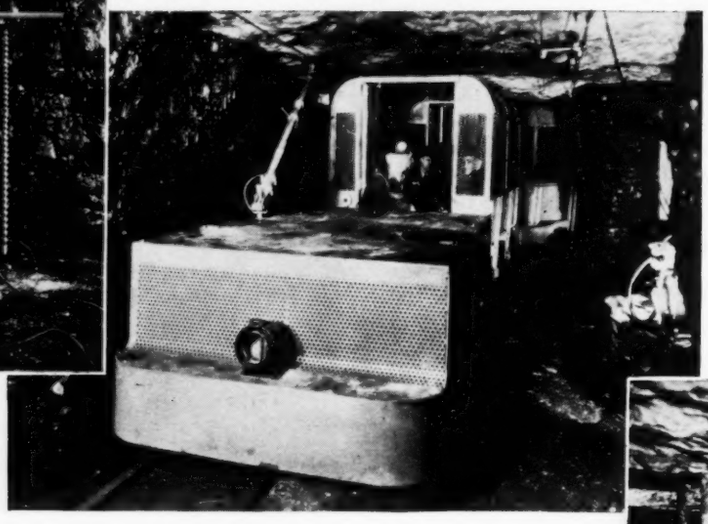
Greetings, Mayor and other distinguished guests.

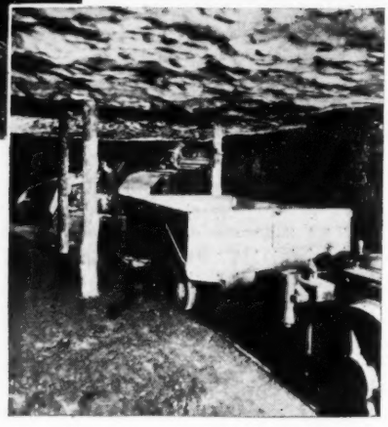
SATURDAY • JUNE 17

Inspection Tour to "Man-Made" Mine at Rosenwald Museum of Science and Industry and to Century of Progress Exposition.

"Underground" at the Rosenwald Mine







"MAN-MADE" MINE

+ Opened for Convention Visitors

To Chicago by Rosenwald Museum

WHILE workers labored feverishly to put the finishing touches on Chicago's Century of Progress Exposition last month, a little farther south the staff of the Rosenwald Museum of Science and Industry was equally busy creating a man-made mine. This unique exhibit—the first to be housed in the rehabilitated Fine Arts Building of the Columbian (World's Fair) Exposition of forty years ago in Jackson Park—is being rushed to completion so that it will be ready for private inspection by members of the National Coal Association and the National Retail Coal Merchants' Association when the former organization holds its fourteenth annual convention at Chicago, June 15-17.

The mining exhibit, which will be formally dedicated on June 19, will not be open to the general public until July 1. When the Century of Progress Exposition ends on Nov. 1, the Museum of Science and Industry also will be closed until the other permanent exhibits planned for the Rosenwald Museum have been installed. Museum officials estimate that it may take from eighteen months to two years to complete these installations.

Entering the Museum building, the visitor sees a full-size mine hoist with its electric controls and reeling 500 ft. of cable. Beyond the hoist is an all-welded steel headframe rising 65 ft. above the main floor, with cage and skip operating on alternate three-minute cycles. Beyond the headframe is the ventilating fan with parts of its metal housing cut away and inclosed in glass so that the visitor can see the fan sending its 30,000 cu.ft. of air per minute to the underground workings. A manway is adjacent to the fan housing.

Ascending the stairs around the headframe, the visitor and his companions enter the cage for the descent underground. The cage can carry 30 people, and, as it descends, the skip hoist with its load of coal starts up from the shaft bottom. In a drop of a few feet, the visitor is given all the sensations of a 500-ft. descent. Leaving the cage at the shaft bottom, the visitor then inspects the pumproom and the underground office of the mine superintendent. After seeing a trip of cars automatically weighed as the cars pass into a rotary dump, the visitor and his companions ascend a short ramp and enter man-trip cars for the journey to the working face.

A three-minute ride through semi-darkness—the locomotive stops and, without leaving the cars, the visiting group watch the operation of a short-wall cutter and a coal getter in low-seam coal. Then the train moves on to the next working place, where the visitors disembark and walk through rooms which already have been mined and which have the pillars still standing for roof support. Next the group sees a modern arcwall cutter in action and then a mobile loading machine. A post drill also is in operation, so that the uninitiated may see how the face is prepared for shooting.

One of the outstanding features of the exhibit is the appearance of the coal faces. As will be seen from the illustrations on the opposite page, these faces have all the characteristics of actual coal in place. There is no illusion about it: what the visitor sees is real coal. This has been made possible through the recent development of a process in which a thin section of the coal face is backed with magnesium cement. In this way, important fossil and geological formations have been preserved. This system also has been employed in the building of the room exhibit of the Peabody Coal Co. at the Century of Progress Exposition.

As the visitors proceed up the counter gangway, they are able to look up and down the chutes that have been worked in a pitching seam and so get a good idea of that method of mining as well as of the more conventional room-and-pillar method. A motor-generator set also is on exhibition. After viewing the underground substation, the visitors leave the underground workings by a temporary exit stairway and again find themselves on the main floor of the Museum, ready to examine a group of exhibits on the social and economic aspects of the coal industry.

These exhibits will include a "Colonnade of American Coals," showing sections of the principal coal seams of the country and descriptive matter on their characteristics. Data on the utilization of coal, with models of power plants, locomotives and steamships also will be displayed. Motion pictures covering various phases of coal mining will be shown in a small theater in the Museum.

In addition to the equipment underground and in the headframe, the exhibit also will include a number of other full-size machines, such as locomotives, cutters and loaders, on the main floor of the Museum. Preparation processes will be illustrated by working models of several of the modern mechanical cleaning systems. Safety equipment, such as protective clothing and gas detectors, will be a part of the exhibit. One phase of the safety section will be a number of lamps from the collection of J. T. Beard, formerly senior associate editor, *Coal Age*, and loaned by the University of West Virginia, illustrating the development in that equipment from the Davey to the most modern types of safety lamp. Plans are being made for displays featuring the historical development of some types of mining machinery. At the conclusion of the Century of Progress Exposition, some of the exhibits there will be transferred to the Museum for permanent display.

Leading coal operators, manufacturers of mining machinery and consulting engineers have cooperated with the Museum staff in planning and developing this exhibit featuring the work of one of the nation's basic industries. Twelve men will be employed to operate the mine and equipment and to explain the exhibits to visitors. The Museum was founded by the late Julius Rosenwald.

WHAT PRICE SLACK?

+ Depression Obscures Growing Demand For Fine Coal by Industrial Markets

By G. B. GOULD

President, Fuel Engineering Co. of New York

SIZING of coal, originally instituted to give the consumer his fuel in the form in which he could most satisfactorily use it, has created new marketing problems. The consumer has become conscious of size as a distinct element of *value*. As a result there has been a differentiation in price according to size that is many times greater than the difference in energy value. Presumably this is due in a general way to the fact that a greater amount of energy can be recovered from one size than another, because the equipment in use is better adapted to that size.

Taking the long view of it, a differentiation in price according to size, or any other characteristic of coal, is determined by the combined total of consumer preferences. These preferences are partly controlled by rigid engineering limitations built into the plant, but they are also due in part to personal prejudices and habits, which naturally resist change. A price for one size considerably below the price for other sizes of the same coal has the practical effect of increasing the capital value of the plant so equipped and operated that it can efficiently use the cheaper size. Temporarily at least, this makes the installation of equipment or the modification of methods suitable to the use of the cheaper sizes financially attractive. Eventually this will build up the demand for the cheaper size to a point that will wipe out the price differential between it and the size next higher in price.

The relatively low price of slack, however, is not wholly a matter of supply and demand. There is no doubt that it is considerably affected by the persistence of the idea, once true, that slack is a "waste" product, instead of just another size. It is true, of course, that in some regions and in some mines the smaller sizes differ from the larger sizes in other characteristics that affect their value—more in some than in others—but for several years the general level of the price of slack has been out of line with the recoverable energy value of it, as compared with other sizes.

With present equipment and methods of use, demand for the smaller sizes must come almost exclusively from the industries and public utilities, and it is interesting to compare the potential demand with the tonnage of slack produced in a year of large consumption. The year 1929 is taken because of the complete data available for that year. It is necessary to divide the principal industrial section of the country into six natural market divisions so that the consumption in each one can be related to the output in the producing section that naturally supplies it. These divisions are:

1. New England (actually including only the eastern portion economically accessible to water-borne coal from the Southern fields.
2. Mid-Atlantic (including the remainder of New England).
3. Pittsburgh.
4. Central.
5. Mid-West.
6. Lakes.

The slack produced in the southern West Virginia low-volatile fields in 1929 was about 17,000,000 tons. The three main outlets for this coal for industrial use are the New England market, seaport areas in the Mid-Atlantic division, and the Southern industrial States—Virginia, North and South Carolina. In 1929, we estimate the industrial consumption of this coal in the New England division at 9,000,000 tons; in the Mid-Atlantic, 4,000,000; and in the Southern states, 8,000,000—a total of 21,000,000 tons.

This is a fairly close balance, but there are other scattered markets which will add something to this visible demand. In this case, in the other market divisions to be discussed, there is an additional potential demand for slack among those users that fall in between the strictly industrial classification (including public utilities) and the strictly domestic, such as public institutions, apartment houses, office buildings, etc. From the standpoint of coal selection,

Table I—Regional Distribution of Coal Consumption in 1929*

(These figures include only coal shipped from the mines. Do not include coal used locally, made into coke at the mines, or coal used by railroads for locomotive fuel)

(In thousands of net tons)

Consumption	New England	Mid-Atlantic	Pittsburgh	Central	Mid-Western	Upper Lakes	Total
Industrial and Electric Utility	9,000	56,000	68,000	28,000	54,000	9,000	224,000
Domestic	8,000	35,000	8,000	9,500	16,500	5,500	82,500
Other Uses	3,500	9,000	4,500	5,500	10,000	2,000	34,500
Totals	20,500	100,000	80,500	43,000	80,500	16,500	341,000
Source of Supply							
Pennsylvania, Maryland, Northern West Virginia Low and Medium Volatile	....	36,000	1,000	....	....	....	37,000
Pennsylvania, Northern West Virginia and Ohio High Volatile	....	14,000	76,000	2,000	1,000	5,000	98,000
Southern West Virginia Low Volatile	12,500	4,000	....	8,000	14,000	4,000	42,500
Southern West Virginia and Eastern Kentucky High Volatile	....	....	....	32,000	18,000	6,000	56,000
Illinois, Indiana, Western Kentucky and Iowa	....	....	....	....	46,500	....	46,500
Total Bituminous	12,500	54,000	77,000	42,000	79,500	15,000	280,000
Anthracite							
No. 2 Buck and smaller	....	8,000	....	....	....	....	8,000
Domestic Sizes	8,000	38,000	3,500	1,000	1,000	1,500	53,000
Total All Coal	20,500	100,000	80,500	43,000	80,500	16,500	341,000

*These and other figures in this article are based upon the Industrial Census figures for industrial consumption, various estimates by the Bureau of Mines, and distribution studies of the Brookings Institution.

this demand shades off from one classification to the other, and some portion of it undoubtedly can use the smaller sizes of coal. In the New England division, we have put this intermediate demand at 3,500,000 tons.

The Central division in 1929 consumed approximately 33,500,000 tons for other than strictly domestic purposes. The output of slack from the high-volatile fields of southern West Virginia and eastern Kentucky, from which this division chiefly draws its coal, was less than 30,000,000 tons. In addition, there is a market for 11,000,000 tons in the Upper Lake trade, which draws two-thirds of its requirements from these fields and from which some 6,000,000 tons was shipped in 1929.

Against the 64,000,000 tons estimated consumption in the Mid-West market for other than domestic use, there was less than half that quantity of slack produced in Illinois, Indiana, western Kentucky and Iowa.

In the Pittsburgh area, total consumption, exclusive of domestic use, was 72,500,000 tons, but slack production in that section was less than 20,000,000 tons. In the Mid-Atlantic market, the production of slack has been almost negligible among the low- and medium-volatile coals produced within this area, although proportionately the output of slack in this area has been increasing in recent years.

From these figures, it can be seen that there is a potential market for slack which may easily exceed the normal supply and give slack quite a different position in the market from the one it has traditionally occupied, unless we have entered upon a period of permanently reduced manufacturing activity. What has happened to the slack market since 1929 is obviously due to the fact that the industrial consumer who furnishes the demand for slack, has reduced his scale of operations and his need for coal to a much greater extent than it is possible to reduce the quantity of coal needed for domestic heating.

The present and future market position of the small sizes of coal, while important to the producer as a factor in his average realization, and to the industrial consumer as it affects his fuel costs, comprises only part of the larger problem of the distribution and consumption of coal for all purposes. Estimates covering total consumption of coal in each of the six major market divisions separately, and the approximate source of coal consumed in each of them, are summarized in Table I.

This arrangement of the facts regarding coal consumption does not reveal to anyone familiar with the general structure of the coal market anything new with respect to the general relation of certain markets to the main producing areas. The domestic use of coal differs from the industrial, however, in that it does not conform so strictly to purely economic considerations, although we may be on the threshold of engineering developments which will enable the domestic consumer more easily to do so. Up to the present time, the small coal consumer has been governed in his choice of fuel more by factors of personal convenience and comfort, and consequently—for example, in the Middle West—large quantities of low-volatile southern West Virginia coal invade a market far removed from the point of production, and in eastern New England there is a sharp line of demarcation between anthracite for domestic use and low-volatile bituminous for other purposes.

It will be noticed that there is approximate agreement between the estimates for domestic consumption and the quantity of low-volatile southern West Virginia coal used in the Central, Mid-Western and Upper Lakes divisions of the market. It cannot be assumed from this that the whole quantity of this type of coal sold in these markets goes exclusively into domestic use. For

Major Consuming Areas and Center of Greatest Concentration in Industrial Consumption of Coal in United States in 1929.

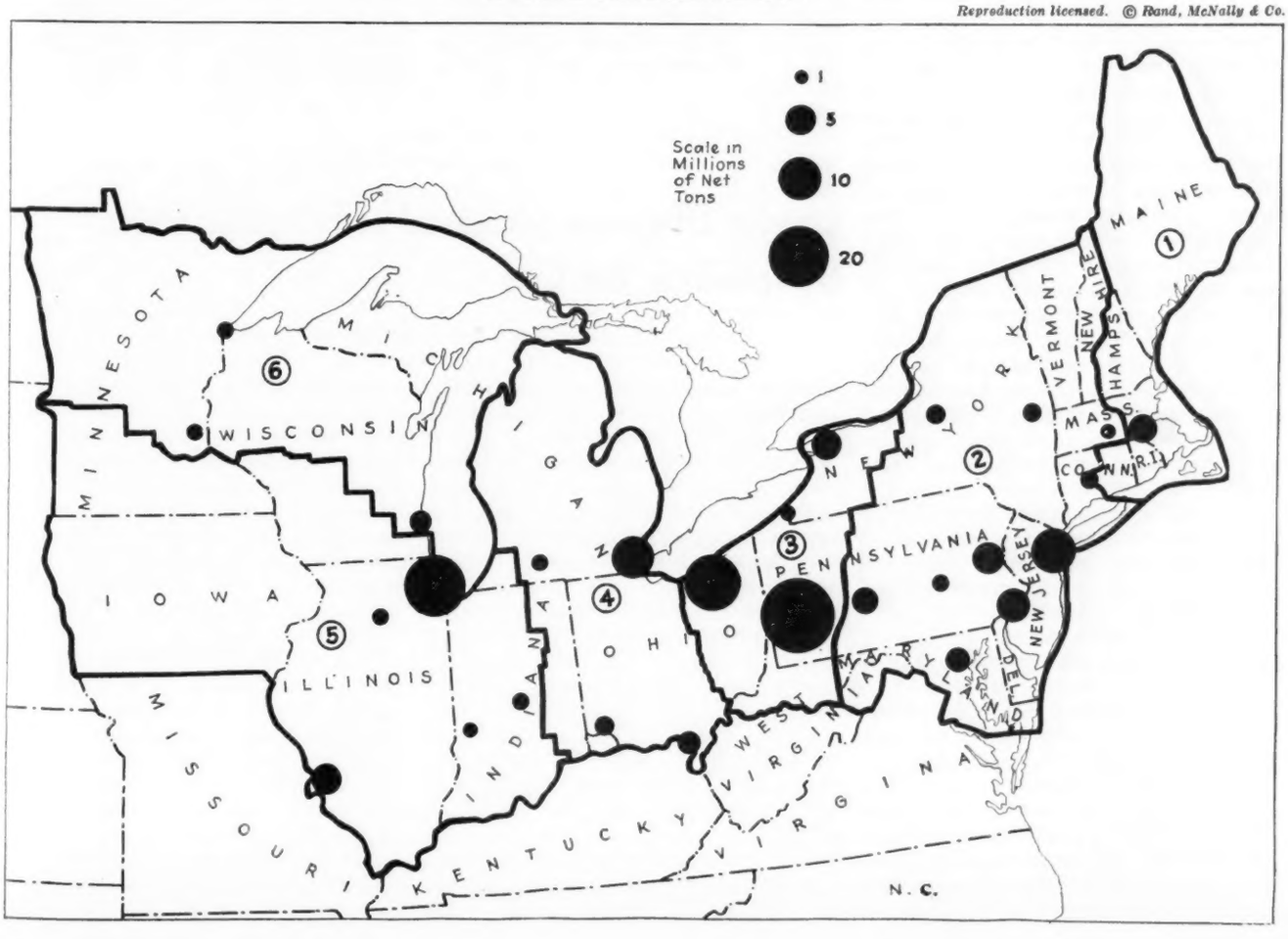


Table II—27 Major Areas of Industrial Coal Consumption in 1929

(In thousands of net tons)

Consuming Area	Bituminous	Anthracite (Bit. equiv.)	Total Coal
1. Pittsburgh	32,557	191	32,748
2. Chicago	22,824	215	23,039
3. Cleveland-Youngstown	18,728	48	18,776
4. New York	8,143	2,764	10,907
5. Detroit-Toledo	9,697	34	9,731
6. Philadelphia	5,893	849	6,742
7. Bethlehem, Pa.	3,823	1,242	5,065
8. Buffalo, N. Y.	4,614	106	4,720
9. Boston-Providence	4,439	148	4,587
10. St. Louis	4,538	33	4,571
11. Johnstown-Altoona	4,275	...	4,275
12. Milwaukee	2,956	50	3,006
13. Baltimore	2,788	130	2,918
14. Portsmouth, Ohio	2,495	...	2,495
15. Cincinnati	2,358	21	2,379
Sub-Total	130,128	5,831	135,959
16. Syracuse, N. Y.	1,710	74	1,784
17. Harrisburg, Pa.	1,426	254	1,680
18. New Haven, Conn.	1,569	52	1,621
19. Duluth, Minn.	1,402	129	1,531
20. Albany, New York	1,351	166	1,517
21. La Salle, Ill.	1,271	95	1,366
22. Indianapolis, Ind.	1,301	11	1,312
23. Minneapolis, Minn.	1,263	11	1,274
24. Erie, Pa.	1,220	19	1,239
25. Worcester, Mass.	1,054	70	1,124
26. Terre Haute, Ind.	1,133	16	1,149
27. Kalamazoo, Mich.	999	60	1,059
Sub-total	15,699	957	16,656
Total	145,827	6,788	152,615
Total Northeastern states	186,139	9,194	195,333
Total United States	214,025	9,746	223,771

one thing, the total shipped into these three sections is about twice the total tonnage of prepared sizes produced in that section of the coal fields. Some portion of the domestic demand is supplied by prepared sizes of the high-volatile coals available to or produced within these market divisions, and part of the low-volatile coal is slack and run-of-mine, some of which is used in those plants that fall between the strictly domestic plant and the large industrial.

There also is a large consumption of this type of coal shipped into this section for the manufacture of coke. This Mid-West division presents the greatest diversification in use and in source of supply. It is an interesting fact that this market division, containing within its borders one of the major coal-producing areas, imports from more distant regions more than 40 per cent of its fuel.

These are familiar facts, although quantitatively stated they take on new significance. This arrangement of the tonnage figures according to the natural market divisions is presented because it suggests a possibly more fruitful framework on which future market research might be constructed. Arranged in this way, too, the figures lead to some interesting and enlightening facts regarding the coal market, when compared with previous years.

The year 1918 may well be compared with 1929, since the total consumption was nearly the same in both years. In that interval, however, shipments of Illinois and western Kentucky coal into the Mid-Western division of the market declined 14,700,000 tons, while shipments into the same market from southern West Virginia increased 14,600,000 tons. Shipments of Ohio coal to the Lakes dropped 6,400,000 tons; shipments from southern West Virginia and neighboring fields increased 15,700,000 tons. Ohio shipments to Ohio and Michigan points declined 10,500,000 tons, while shipments to those states from Southern fields rose 19,200,000 tons, and those from the Pittsburgh area increased 6,200,000 tons.

All-rail bituminous coal into New England, chiefly low- and medium-volatile coal from Pennsylvania, Maryland and northern West Virginia, declined 5,700,000 tons. It is safe to assume that, in so far as this tonnage was replaced by coal, its place was taken by water-borne low-volatile coals from southern West Virginia.

The average quality of these coals is better than the average of those coals which would go by rail to New England from the Mid-Atlantic section, but their chief competitive advantage lies in low water transportation costs and lower labor costs. The question naturally arises as to whether this market could not have been held for the low-volatile coals of the Northern fields, and the railroads serving that section saved several million tons of traffic if rail freight rates had been promptly reduced to a competitive level after the War.

The capture of the growing consumption in the Central area by Southern high-volatile coals is a logical development, but the gains made by these coals in the Mid-West can probably be attributed largely to the highly unionized character of the Mid-West producing fields, with the consequent difficulty of reducing wage costs. Recent adjustments of wages and freight rates in Illinois may be helpful in restoring a portion of this local market to Mid-Western coals. The development of the small stoker may further assist this restoration. There is ahead, therefore, a possible swing-back from the present alignment, and the effects of this intersectional competition may be felt at distant points, for the reason that demand for coal would be reduced in a section of the coal fields which normally supplies other large consuming areas.

▼

Loader Efficiency Increased at Fairpoint Mine By Installing Big Cars

(*Concluded from page 176*)

dumping trucks are provided for the coal bin. These move up and down from car to car on electrically propelled trucks, one truck dumping to one side of the bin and the other to the opposite side. R. S. Walker also was responsible for the design of the equipment.

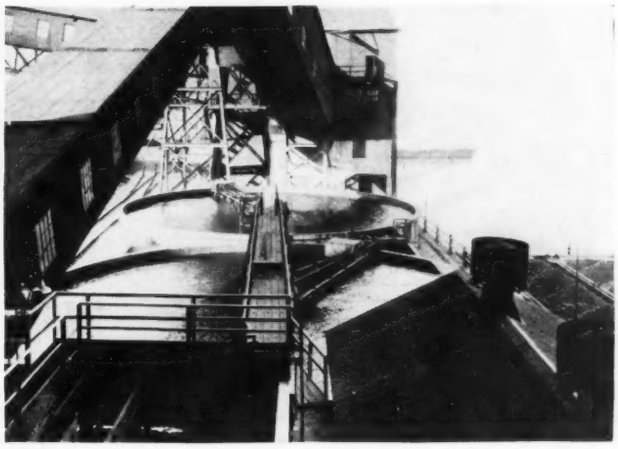
In dumping an individual car, the car body is tilted sidewise by an articulated arm with mechanical fingers which engage the angle iron on the car body just below the hinges of the doors. A safety dog is automatically attached to the car body to keep it from turning over into the bin. The dumping arm is actuated by two compressed-air cylinders, into the larger of which (18 in. diameter) is telescoped a 6-in. cylinder. When air is admitted, the larger cylinder is extended to the limit of its travel, whereupon the smaller cylinder is pushed out to complete the dumping cycle. The lower end of the large cylinder is attached through a swivel to the movable truck, and the smaller cylinder is pinned to the dumping arm, as shown in an accompanying illustration.

Actual dumping time consumes an average of one-quarter of a minute per car, including spotting. Dumping a trip of cars is done at the rate of four-tenths of a minute per car, or 12 tons of coal per minute.

Coal is discharged from the bin through two openings 3½ ft. square onto variable-speed reciprocating feeders, which in turn discharge onto a drag-chain conveyor. This conveyor feeds onto a cross conveyor which takes the coal to the main sizing shakers. The control for the feeders is located at the Simon-Carves washer (*Coal Age*, October, 1931, p. 527) to enable the operative to regulate the feed to the wash-box.

WASHING COAL

+ For Coking Purposes At Clairton Byproduct Coke Works



Dorr Thickeners and Transfer Tower.

By H. W. SEYLER

Chief Chemist, Clairton Coke Works
Carnegie Steel Co.
Clairton, Pa.

THE coal-washing plant of the Carnegie Steel Co. is located at Clairton, Pa., and is operated in conjunction with the Clairton byproduct coke works. The washed coal is made into metallurgical coke for the blast furnaces of the Carnegie Steel Co. and other subsidiary companies of the United States Steel Corporation in the Pittsburgh and Youngstown districts.

During normal operations the average amount of coal carbonized at Clairton is 30,287 net tons per day. Table I shows the approximate daily tonnage received from the mines of the H. C. Frick Coke Co.

With the exception of Calumet, the mines named are located in Fayette County, Pennsylvania, in what is known as the Klondyke Basin of the Pittsburgh seam. Each mine, excepting Calumet, has loading facilities on the Monongahela River permitting barge shipments of its production.

Due to the large coking-coal requirements of the Clairton plant, the quantity of low-ash and low-sulphur coals available in these mines is diminishing. The reasonably low-ash and low-sulphur coal supplied to the Clairton plant at the present time can be obtained only by careful mining and preparation at the face. Any period of a lessened labor supply or the adoption of mechanical mining and loading would bring about a condition whereby the coal furnished would be unsuitable for the required quality of metallurgical coke. Without a washing plant, it would also be necessary to leave a portion of the coal in the top and bottom of the seam, on account of its high ash and sulphur content. This unmined portion of the seam amounts to practically 24,000,000 tons in the present workings. By washing, this can be made available for coking purposes.

A 60-year forecast of the coal tonnage available for river shipping shows that these coals are of higher ash and sulphur content than the present coals. This forecast, together with the uncertainty in quality of these coals, prompted the construction of a washing plant at Clairton which would improve the quality of the present Bridgeport and Colonial coals and at the same time develop operating data and experience for any future treatment of the lower grade coals. A central washing plant at Clairton was considered more economical, both from a construction and operating standpoint, than smaller individual units at the river mines.

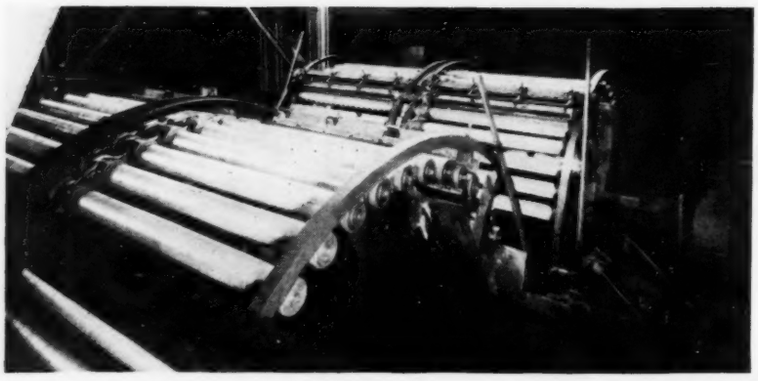
It was anticipated that, aside from the ash and sulphur reduction, the washing of these coals would effect a material improvement in the physical qualities of the coke produced. The importance of this point is shown by the fact that the unwashed Bridgeport coal when coked separately produced an undesirable coke for metallurgical purposes, due principally to its inferior physical structure. This coal, which contains the greatest percentage of slate and feebly coking bone coal, is considered most representative of the coal reserves. In order to produce satisfactory metallurgical coke, it was necessary to mix approximately 33 per cent of lower volatile and superior coking quality Calumet coal with the Bridgeport coal.

A coking test, made on 5,000 tons of Bridgeport washed coal, substantiated the results of smaller scale preliminary tests and showed that the removal of the slate and bone coal materially improved the physical properties of the resultant coke. The elimination of this slate and bone coal is most essential in the sizes ranging from $\frac{3}{8}$-in. to 20-mesh in that for each per cent of slate present in the smaller sizes the number of fractures set up by the slate particles exceeds the number of fractures set up by the same percentage in the large sizes. However, when the size of slate particles reaches 20-mesh or smaller, in amounts not exceeding 10 per cent, they are absorbed in the coke structure and become either inert in relation to the coke structure or actually increase the physical strength of the coke. It was, therefore, with a dual purpose in mind that the present coal-washing plant was installed; i.e., the improvement of the physical properties of the metallurgical coke as well as a reduction in ash and sulphur.

The coal-washing plant started opera-

Table I

Mine	Coal Carbonized Per Day Net Tons	Method of Delivery	Average Volatile Matter Per Cent	Average Ash Per Cent	Average Sulphur Per Cent
Colonial	10,190	Barge	32.95	8.84	1.25
Ronco	3,906	Barge	32.93	7.88	1.07
Palmer	8,665	Barge	32.90	8.10	1.04
Gates	4,209	Barge	32.91	8.26	.97
Bridgeport	2,272	Barge	33.60	9.58	1.70
Calumet	1,045	Rail	28.78	9.00	1.33
Total	30,287				



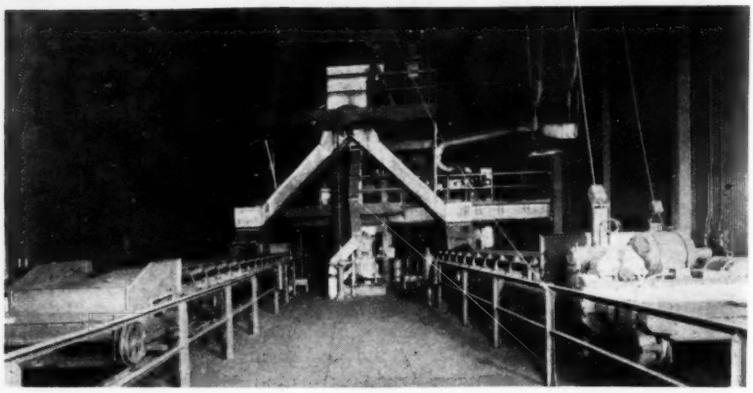
Genter Type Oscillating Continuous Filters.

tions on Oct. 1, 1931, and was designed for a capacity of 12,000 net tons of raw coal in two ten-hour shifts per day. The plant, using the Rheolaveur process, was designed to operate on a two- or three-product separation in both the coarse- and fine-coal plants. The washing plant was so located that the existing coal-handling equipment in use at the coke works could be utilized. The designed capacity of the washing plant is sufficient to clean only approximately one-third of the coal required for carbonization during full operation of the coke plant, but it is considered that this installation is only the first step of a program to install plants to clean all of the coal carbonized.

The run-of-mine coal received in barges from the mines is unloaded at one of the hoists by two 6-ton clamshell buckets into two 250-ton bins, from which is passes over Perisertread screens; the fine coal is bypassed and the 3-in. or larger coal is passed through two roll crushers with rolls set 2 in. apart. The crushed lumps and the screenings are simultaneously fed onto a 42-in. belt conveyor with a capacity of 750 tons per hour which conveys the coal to a transfer tower. From here it is transferred to another 42-in. belt conveyor leading to the bins at the top of the washing plant. Shuttle conveyors are located at the top of the three 1,000-ton, two-compartment bins to permit the washing of three kinds of coal at one time, as well as the handling of coal in barge lots of 800 tons each.

Under the storage bins six belt feeders arranged in groups of two, one for each bin compartment, are provided for the withdrawal of the coal and delivery to a raw-coal collecting conveyor. These feeders have a variable speed and an adjustable feeding device so that any desired mixture of coal can be fed to the washing plant.

The collecting conveyor delivers the coal to four rotary feeders, feeding four Hum-mer screens. The screens have $\frac{5}{16}$-in. openings and serve to screen out the greater portion of the minus $\frac{5}{16}$-in. coal for direct delivery to the fine-coal Rheolaveur washing plant.



Discharge Hopper of 42-In. Raw-coal Conveyor Belt; Distributing Chutes and Shuttle Conveyors Above Washing-Plant Bins.

Although the plant was designed for a total feed of 600 tons per hour, it has been operating at an average of 700 tons per hour. The coarse-coal Rheolaveur sealed-discharge launders wash approximately 65 per cent of the feed coal; the fine-coal free-discharge launders handle the remainder.

Oversize coal from the Hum-mer screens is fed to two 48-in. primary or main sealed-discharge washing launders operating in parallel, each equipped with two Rheo boxes. The heavy slate and boney material removed in the first Rheo box from each main launder is elevated by a sealed-boot elevator to the head of a 32-in. secondary or rewashing launder. Material removed from the second Rheo boxes on each of the main launders is returned by a sealed-boot elevator to the head of the main launder to be used as a regulating material for the most efficient separation of clean coal.

Material passing over the second boxes of the main launders is the metallurgical washed coal and is passed over double-decked sizing and dewatering shaking screens of the flexible wood hanger type. The top deck of each is equipped with $\frac{1}{2}$x$\frac{3}{4}$x10-in. Perisertread screens and the lower decks with $\frac{3}{8}$-in. round-hole screens. The coal over these screens, containing 3.0 per cent moisture, is conveyed to the main cleaned-metallurgical-coal conveyor and the coal through the lower decks is sluiced to the fine-coal washing plant.

The materials to the rewashing launder pass over two Rheo boxes in the rewashing process. In the first box the refuse and some of the heavier bone, especially that consisting of laminated coal and slate, are removed. The second box removes some slate and bone coal which is returned as regulating material. The coal passing over both boxes is dewatered and screened as in the case of the main launder product.

The slate, heavy bone and laminated materials removed in the first box of the rewashing launder are screened over a double-decked shaker screen with $1\frac{1}{4}$-in. and $\frac{3}{8}$-in. perforated plates. Material over the $1\frac{1}{4}$-in. deck is broken up by an American ring-mill crusher to $1\frac{1}{4}$-in. size and returned to either the main washing launder or final rewash launder. The material from the $\frac{3}{8}$-in. deck is delivered to a 24-in. final rewashing launder provided with two Rheo boxes. The material through the lower deck of the bone shaker screen is sluiced to the fine-coal plant. The final refuse from $\frac{3}{8}$-in. deck material is removed in the first box and the regulating material in the second. This refuse is screened over a double-decked shaker screen, the top deck equipped with a $\frac{3}{8}$-in. screen, the lower deck being a blank plate. The refuse over the top deck is delivered to the refuse boot and the minus $\frac{3}{8}$-in. refuse from the lower deck is sluiced to the fine-coal boot to be rewashed in the fine-coal plant. The washed product from this final rewash launder, after being dewatered and screened, as in the case of the other launder products, is delivered either to the washed-metallurgical-coal conveyor or to the middling-coal elevator boot.

Undersize coal from the raw-coal Hum-mer screens, together with the undersize from the washed-coarse-coal shaker screens, is sluiced to two fine-coal boots, from which it is elevated by two dewatering bucket elevators. From the head of each elevator the material is divided equally between two drag conveyors for delivery to the two free-discharge fine-coal-washing plants, operating in parallel.

The two Rheolaveur free-discharge washing units, each five launders high, are identical in general arrangement and operation. The top two launders of each unit are 14-in. double launders. The free-discharge units are of special design for the maximum washing efficiency of the fine coal, being 80 ft. long and containing a total of 198 Rheo boxes. The raw coal is fed in at the upper end of the top launders and when operating on a two-product separation—metallurgical coal and refuse—the washed metallurgical coal is recovered from the top two launders as well as from the upper portion of the third launder. The product from the top two launders is partially dewatered as it passes over a section of wedge-wire screen at the end of these launders and sluiced with the third launder product to two balanced-deck dewatering wedge-wire shaker screens before being finally dried in the centrifugal dryers.

The product from the lower portion of the third launder, as well as that from the fourth and fifth launders, is delivered to the fine-coal elevator boot for recirculation as a regulating material. The final refuse, 0x$\frac{3}{8}$ in., which has been concentrated from the top to the bottom of the five washing units, is collected in a sluiceway and sluiced to a refuse boot, from which a dewatering bucket elevator delivers it to a 500-ton refuse bin.

The circulating water collected under the coarse-coal dewatering screens and the minus $\frac{3}{8}$-in. raw-coal sluiceway water tank. It is drawn from the constant-head tank for push water in all the coarse-coal launders and to sluice the minus $\frac{3}{8}$-in. product from the raw-coal Hum-mer screens and bone shaker screen. The overflow water from the settling tank, fine-coal, refuse, and middling boots flows through sluiceways to two 70-ft. diameter Dorr thickeners. The water from the Dorr thickeners, with solids reduced from 14 to 5 per cent, overflows into a sump and is pumped to a 5,000-gal. clarified-water tank where it is diluted with the filtrate from the filters. The clarified water is principally used as push water in the fine-coal launders and as a diluent for the circulating water.

The circulation of water in the system totals 7,000 gal. per minute, or 10 gal. per minute per ton of feed coal per hour, being divided as 3,600 gal. of circulating and 3,400 gal. of clarified water. The coarse-coal plant requirements are 4,200 and the fine-coal plant 2,500 gal. per minute. Fresh water added to the system amounts to 70 gal. per minute. The water in the system is maintained at 7.0 pH, or neutral point, by a liming unit, which feeds the lime to the sluiceway carrying the minus $\frac{3}{8}$-in. raw coal from the Hummer screens. It is important to point out here that it has been found advantageous to wash the coal as soon as possible after mining, as the acidity in moist coal increases very rapidly on storage. Coal held in barges more than 30 days after mining gives a serious problem for washery-water neutralization, as the acid content of the coal reaches such a point that it becomes almost impossible to maintain a neutral water in the system by adding lime at any one point.

The underflow from the Dorr thickeners, containing 40 to 45 per cent solids, is received in a pump sump, from which it is pumped to two Genter type oscillating continuous filters. Each filter is of the twin type and has a capacity of 25 tons of coal per hour and a screen area of 700 sq.ft. The oscillating movement of the filter elements, as they move through the sludge bath contained in a tank, serves to keep the sludge well agitated. The 80 elements of each filter are screen-covered tubes, and the experience at this plant to date indicates that stainless steel screens are most economical for this service.

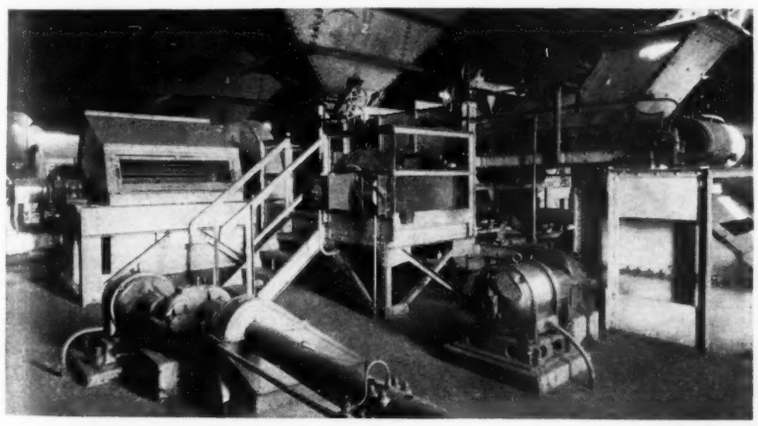
Table II

	Per Cent
Moisture	24.45
Size:	
Plus 20-mesh	3.8
20x 28-mesh	2.6
28x 48-mesh	20.2
48x100-mesh	25.3
100x200-mesh	13.9
Minus 200-mesh	34.2

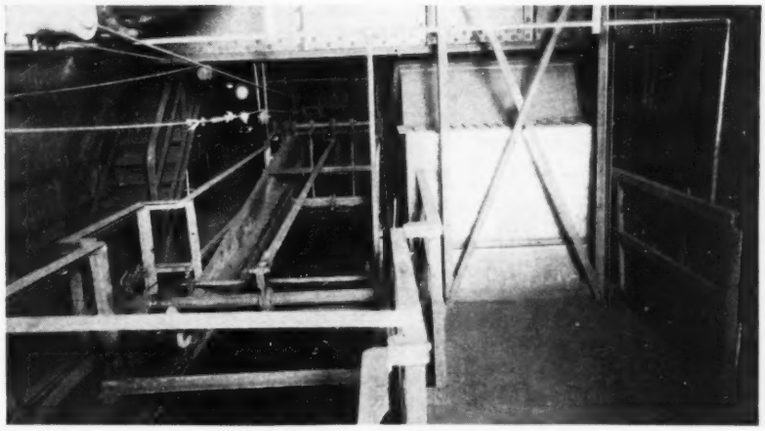
The vacuum pumps maintain a 27-in. vacuum on the tubes during the caking and drying period, and a rotary valve, mounted at one end of the central shaft, automatically controls the application and cessation of suction on the elements entering submergence and leaving the drying arc and then permits the application of atmospheric pressure for cake discharge. The cake thickness usually is maintained at $\frac{5}{8}$ in. and is removed from the tubes by both stationary and flexible wipers.

The dried cake, when removed, falls upon a belt conveyor. This conveyor is supported eccentrically lengthwise within the filter cage and passes through the open end of the filter, where the cake is delivered to the fine-coal boot and settling tank. The water from the fine-coal dewatering shaker screens and the wedge-wire screens at ends of the top two free-discharge launders is sluiced to the settling tank.

Circulating water containing approximately 14 per cent solids is pumped from the bottom of the overflow sump of the settling tank to a 5,000-gal. constant-head tank, where it is diluted with the overflow water from the clarified-



One of the Six Variable-Speed Feeder Conveyors That Deliver Raw Coal to Main Collecting Conveyor.



One of the Rheolaveur 48-in. Main Sealed-Discharge Washing Launders.

is discharged upon a scraper conveyor which carries it to the main washed-metallurgical-coal belt. The size and moisture content of the product are shown in Table II.

The principal advantage of this type of filter is that one or any number of tubes can be removed or replaced within a very short time, thus eliminating the necessity of spare filters and avoiding delays or a complete shutdown of the washery.

The 0x⅜-in. metallurgical washed coal, after passing over the fine-coal dewatering shaking screens, is collected on scraper conveyors equipped with wedge-wire screen sections from which it is fed to six centrifugal dryers, each drying 35 tons of coal per hour. Table III shows the comparative sizes and moisture content of the coal to and from the dryers.

Approximately 11 per cent of the feed to the dryers is recovered with the effluent in the effluent cone, from which it is returned to the dryers as push water through the washed-fine-coal sluiceway. The dried coal is collected beneath the dryers on the main washed-metallurgical-coal conveyor belt.

The main washed-metallurgical-coal collecting conveyor first receives the product from the centrifugal dryers, then the filter product, and then the product from the coarse-coal dewatering screens. These washed products are more thoroughly mixed later as the coal is transferred through mixing chutes to other conveyors and shuttle belts before being received in the bins over the coke ovens.

Arrangements have been made also for the loading of washed coal directly into railroad cars from the main washed-coal collecting conveyor. This arrangement was made for the purpose of making use of the washing plant for experimental purposes in that either all or any representative amount of a test run can be charged to the coke ovens from the railroad cars. Thus any coking tests may be made without the necessity of emptying the large bins over the ovens. The middlings, when produced, are delivered by two feeder scraper conveyors and hinged chutes from the bottom of the middling bins into open-top railroad cars. The refuse is loaded directly from the refuse bins into railroad cars.

Table III

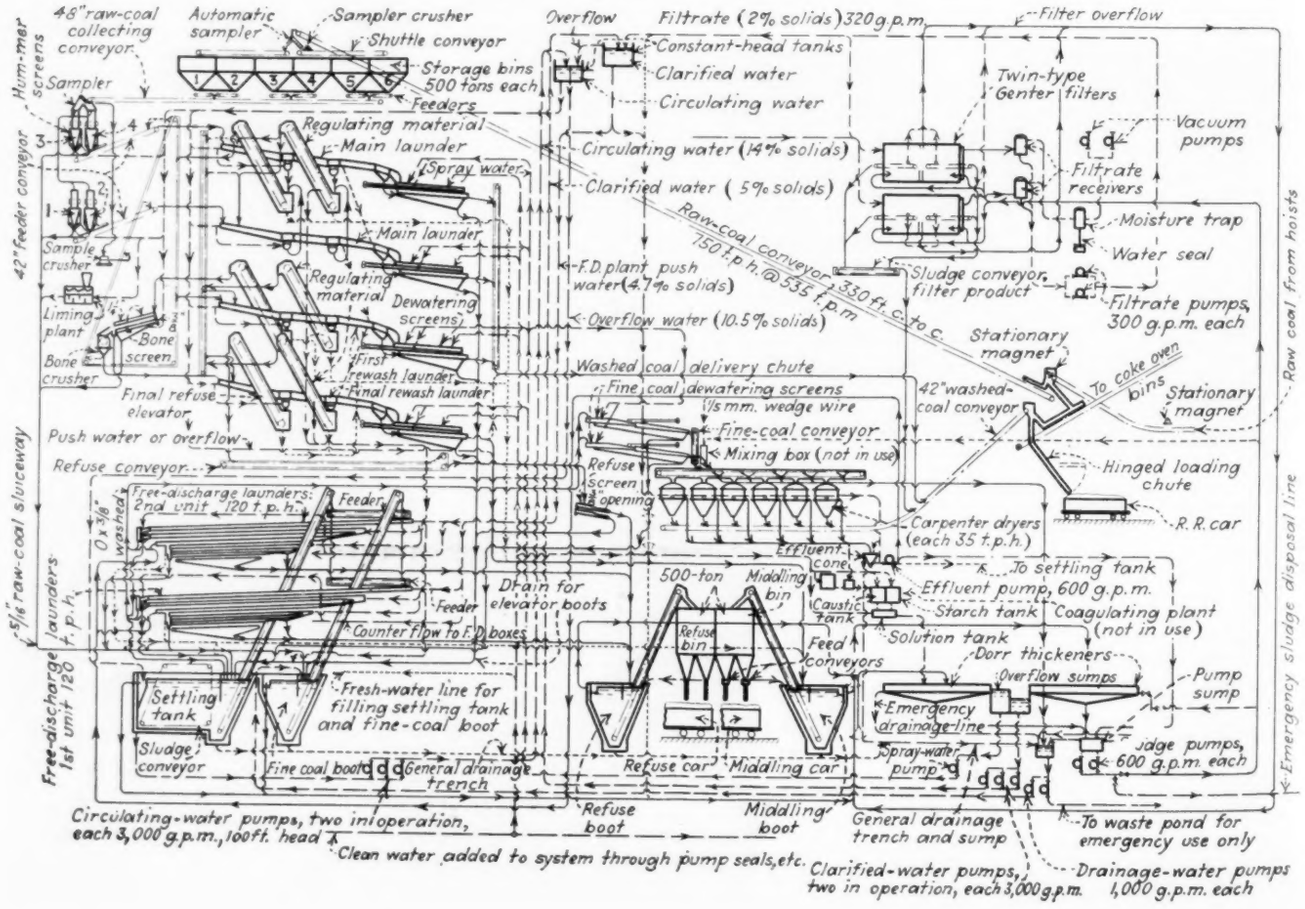
	Coal to Centrifugal Dryers Per Cent	Coal From Centrifugal Dryers Per Cent
Moisture	19.77	7.58
Size:		
On ¼ in. square	14.9	14.5
¼ in. x ⅛ in. square	22.7	22.3
⅛ in. x 20-mesh	43.9	43.6
20x48-mesh	16.4	14.7
48x100-mesh	.8	2.7
Minus 100-mesh	1.3	2.2

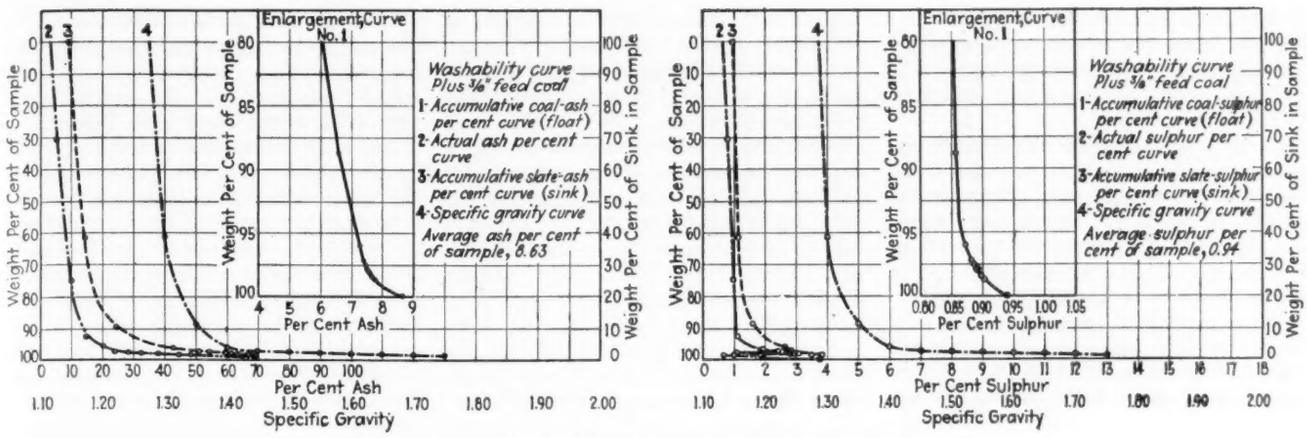
With the exception of motors on the coal feeder belts at the bottom of the raw-coal bins and the Dorr thickeners, all motors in the washing plant are 3-phase, 220-volt induction type. Direct-current motors are used on the feeder belts and Dorr thickeners because of the wide range of speed desired.

Control panels for all motors are located in one central dustproof control room and start and stop pushbuttons for all motors are conveniently grouped on a rack on the operating platform of the sealed-discharge launders. All drives necessary to the flow of coal through the washing plant are electrically interlocked. The total power required for the washing plant is 1.36 kw.-hr. per ton of raw-coal feed.

Direct drives are used on all bucket elevators, as a safety measure to avoid the use of numerous belt or rope drives. In order to use direct drives on the elevators, a bottom take-up was developed by the Koppers-Rheolaveur Co. Stationary magnets are used to remove from the raw coal tramp iron which would prove injurious to the conveying system. Special conveyor chains, designed for maximum strength and endurance, are used to prevent possible breakage.

Fig. 1—Flowsheet, Clairton Coal-Washing Plant.





• Figs. 2 and 3—Washability Curves, Plus ⅜-In. Feed Coal.

The original installation provided cast-iron wearing plates in sealed-discharge launders and in the classification section of free-discharge launders. All chutes and sluiceways having excessive wear and the backs of all dewatering elevators were lined with ⅜-in. thick ordinary steel wearing plates. These plates have since been replaced, except the backs of elevators, with abrasive resisting steel of ⅜, ½ and ⅝ in. thickness. The indications are that these plates will give much better service than the cast-iron plates.

As previously mentioned, the coal-washing plant was installed for the purpose of washing only the high ash and sulphur coals of inferior coking qualities; however, recent economic conditions in the industry have been such that, in order to meet the requirements at the coke works, it has been necessary to operate only those mines having low ash and sulphur. Due to these conditions, the coals currently shipped to the washing plant are from the Colonial and Palmer mines of the H. C. Frick Coke Co. with a small percentage of nut size coal from the National mine of the National Mining Co. The Palmer and Colonial coals are used in equal proportions and, together with a small percentage of National coal, are mixed by the feeder-belt arrangement under the raw-coal bins before being fed to the washing plant.

The analysis and screen sizes of the mixed coal fed to the washing plant are as shown in Table IV.

Washability curves of the plus 3/8-in., the 3/8-in.x20 mesh, and the minus 20-mesh sizes of the above coal are shown in Figs. 2, 3, 4, 5, 6 and 7.

Table IV

Raw-Coal Feed

Sieve	Per Cent	Ash Per Cent	Sulphur Per Cent
Plus 3 in. square...	4.12	9.05	.90
3x2 in. square.....	8.66	8.58	.99
2x1 in. square.....	23.04	9.49	1.06
1x⅜ in. round.....	27.10	9.10	1.07
⅜ in.x20 mesh.....	28.84	7.60	1.09
20 meshx0.....	8.24	7.90	1.42

Tests have shown that an increased ash and sulphur reduction may be effected in the washing plant by breaking up the lump sizes before washing. However, crushing of the coal to finer sizes is not desirable for the best coke-oven practice, inasmuch as the size relationship shown in the foregoing table gives the highest weight per cubic foot of the coal charged to the ovens. When coking 100 per cent high-volatile coals this is a factor of vital importance in that it not only results in maximum production of coke per oven charge, thus reducing operating costs, but gives coke of best quality and facilitates oven operation.

Analysis and float and sink data of products of the coal-washing plant for the month of November, 1932, are shown in Table VIII. Although the washing plant is designed to make separation at two gravities, it has not proved economical to remove the bone coal as a middling product, due to the small percentage present in the raw-coal feed. In the coals for which the washing plant was designed, the percentage of coal between 1.40 and 1.55 gravity approximated 8 to 10 per cent, compared with less than 2 per cent in the coals actually washed. The removal of the small percentage of bone coal present in the coals washed does not give enough improvement in coke quality to warrant the loss of coking coal which naturally accompanies the removal of such a small percentage of bone coal. This is especially true at this time, as the cost of mining coking coal has materially increased, due to the low percentage of mining operations. On the other hand, the cost of boiler fuel, which the middling would replace, is relatively low.

The chief concern under present conditions is to keep the sink in the washed product of 1.55 specific gravity at a minimum, especially in the sizes above 20-mesh, as this non-coking material is most detrimental to the coke structure.

Table V

Washed Coal—Plus ⅜-In. Product From Sealed-Discharge Plant

Float 1.40			Sink 1.40 Float 1.55			Sink 1.55 Float 1.60			Sink 1.60 Float 1.65			Sink 1.65		
Per Cent	Ash, Per Cent	Sulphur, Per Cent	Per Cent	Ash, Per Cent	Sulphur, Per Cent	Per Cent	Ash. Per Cent	Sulphur Per Cent	Per Cent	Ash, Per Cent	Sulphur, Per Cent	Per Cent	Ash, Per Cent	Sulphur Per Cent
98.23	7.3	0.9	1.36	22.6	2.0	0.11	32.3	2.1	0.08	38.4	2.4	0.22	50.1	3.0

Washed Coal—⅜x20-Mesh Product From Free-Discharge Plant

Float 1.55			Sink 1.55 Float 1.60			Sink 1.60 Float 1.65			Sink 1.65 Float 1.75			Sink 1.75		
Per Cent	Ash, Per Cent	Sulphur, Per Cent	Per Cent	Ash, Per Cent	Sulphur, Per Cent	Per Cent	Ash, Per Cent	Sulphur, Per Cent	Per Cent	Ash, Per Cent	Sulphur, Per Cent	Per Cent	Ash, Per Cent	Sulphur Per Cent
99.37	6.5	0.9	0.15	31.5	3.3	0.20	35.9	3.4	0.08	41.2	3.6	0.20	58.1	4.2

Refuse—Plus ⅜-In. Product From Sealed-Discharge Plant

Float 1.40			Sink 1.40 Float 1.45			Sink 1.45 Float 1.50			Sink 1.50 Float 1.55			Sink 1.55		
Per Cent	Ash, Per Cent	Sulphur, Per Cent	Per Cent	Ash, Per Cent	Sulphur, Per Cent	Per Cent	Ash. Per Cent	Sulphur Per Cent	Per Cent	Ash, Per Cent	Sulphur, Per Cent	Per Cent	Ash, Per Cent	Sulphur Per Cent
0.81	11.1	1.2	0.13	20.6	1.9	0.27	25.6	1.7	0.58	31.4	2.0	98.21	71.6	4.6

Refuse—⅜x20-Mesh Product From Free-Discharge Plant

Float 1.40			Sink 1.40 Float 1.45			Sink 1.45 Float 1.50			Sink 1.50 Float 1.55			Sink 1.55		
Per Cent	Ash, Per Cent	Sulphur, Per Cent	Per Cent	Ash, Per Cent	Sulphur, Per Cent	Per Cent	Ash, Per Cent	Sulphur, Per Cent	Per Cent	Ash, Per Cent	Sulphur, Per Cent	Per Cent	Ash, Per Cent	Sulphur Per Cent
2.60	7.3	1.1	0.22	19.8	2.1	0.24	23.8	2.8	0.53	29.2	3.1	96.41	71.9	6.0

It has been possible to keep this percentage below 0.5 in the average of the plus 20-mesh coal and at the same time maintain a low percentage of float coal in the refuse.

A study of this phase of the washing-plant performance is best shown by float-and-sink tests showing the actual quality of the 1.55 sink in the washed coal and the 1.55 float in the refuse. The results of tests made for this study are as shown in Table V.

From an interpretation of the washability curves, indications are that the coarse-coal sealed-discharge plant is operating at about 1.55 gravity and the fine-coal free-discharge plant at 1.65 gravity.

Specifications for quality of products were made with the idea of operating the coarse-coal plant on a two-product separation, and the fine-coal plant on a three-product separation and, therefore, do not really apply to present practice. The specification for plus $\frac{3}{8}$-in. clean coal is that it shall not contain over 1 per cent sink at 1.55 gravity and not over 0.25 per cent sink at 1.65 gravity. The plant is fully meeting this specification. The specification for the $\frac{3}{8}$-in. x20-mesh coal, when operating on a three-product separation, is that it shall not contain over 0.5 per cent sink at 1.55 gravity. The plant is almost meeting this specification while operating on a two-product separation.

The specifications for ash and sulphur are that the plus 48-mesh clean coal shall not exceed by more than 0.5 per cent the percentage of ash in the float coal, and shall not exceed by more than 0.1 per cent the percentage of sulphur in the float coal, when tested at the gravity of final separation. The plant is actually washing to within less than 0.05 per cent of the sulphur and 0.3 per cent of the ash on the over-all clean coal.

Although it is the general opinion that very little beneficiation is made on the sizes less than 48-mesh, Table VI, a comparison of raw and washed coal, shows that some reduction of ash and sulphur is effected on the sizes down to 100-mesh.

The effect of washing upon the character of the coal ash has not been as pronounced on the coals washed at Clairton as has been shown in other washing operations. Washing of the coal has increased the fusion point of the ash approximately 50 deg. F. and has reduced the iron oxide in the ash approximately 1 per cent. The calcium content of the ash is not affected by washing.

The main objection to the use of washed coal is its higher moisture content. As the increase in moisture content is found in the finer sizes, any segregation of these fines results in excessive packing and affects the free flow of coal from the oven bins and charging car hoppers, thus causing delays in oven operation.

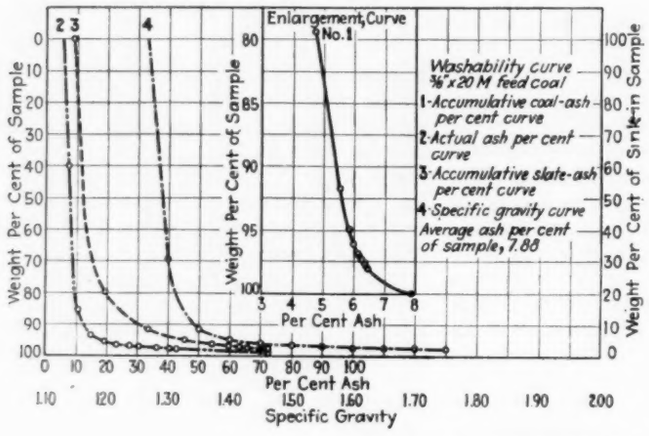
Segregation of the fines in the oven bins can be overcome by a compartment bin of a honeycomb construction, provided that a uniform mixture of sizes is maintained at the washing plant. One of the two bins now being used for washed coal is of the compartment type and gives very satisfactory results. It is advisable also to have this type of bin construction when using coals of lower moisture content, as segregation always takes place in large bins, and, as the finer sizes have a higher ash and sulphur content, any segregation that takes place affects the uniformity and quality of the coke.

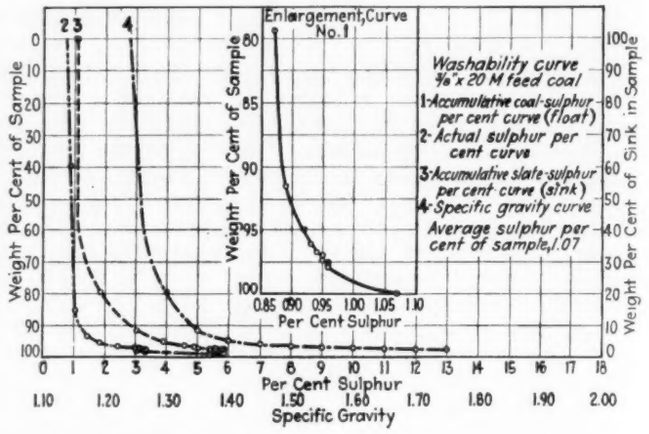
The increase of moisture content of the coal causes an added operating cost for evaporation, condensation and subsequent processing of the excess water recovered as weak ammonia liquor.

Although the excess moisture carried by the washed coal is an added operating cost to the coke plant, it is considered at present to be more economical to evaporate this water in the coke ovens than by any independent process for effecting a substantial moisture reduction in the washing plant. The greatest possibility of reducing the moisture content of the washed coal lies either in reducing the quantity of or the moisture content of the sludge which is now recovered as the filter product and processes or methods for accomplishing either have been seriously considered.

Some of the methods or processes which we believe have possibilities follow:

1. **Separation of the "bug dust" in the mines, which could be used either as a boiler fuel or processed separately.**
2. **Dedusting of the raw coal feed to the washing plant.**
3. **Reduction of fines formed in the mining, crushing and handling of coal.**
4. **Application of an amalgamation process on the Dorr thickeners underflow. It is believed that the use of coal tar as the amalgamating agent would be necessary at Clairton, as the use of**





Figs. 4 and 5—Washability Curves, $\frac{3}{8}$-In. x 20-Mesh Feed Coal.

Table VI

Sieve	Raw Coal — Per Cent	Raw Coal — Ash Per Cent	Raw Coal — Sulphur Per Cent	Washed Coal — Per Cent	Washed Coal — Ash Per Cent	Washed Coal — Sulphur Per Cent
Plus 3 in. square	4.12	9.05	.90	3.64	7.46	.89
3x2 in. square	8.66	8.58	.99	7.95	7.85	.87
2x1 in. square	23.04	9.49	1.06	19.58	7.58	.91
1x½ in. round	27.10	9.10	1.07	31.70	7.69	.97
½ in. x20-mesh	28.84	7.60	1.09	25.49	6.70	.95
20x28-mesh	1.71	6.81	1.13	1.96	5.30	.95
28x48-mesh	3.10	7.06	1.18	3.58	5.28	.95
48x100-mesh	1.79	8.09	1.62	2.32	7.89	1.47
100x200-mesh	.72	9.41	2.35	.81	9.92	2.33
Minus 200-mesh	.92	11.04	1.95	3.03	12.30	1.86

oil would seriously affect the quality of the tar and benzol products.

5. The use of mechanical heat dryers.

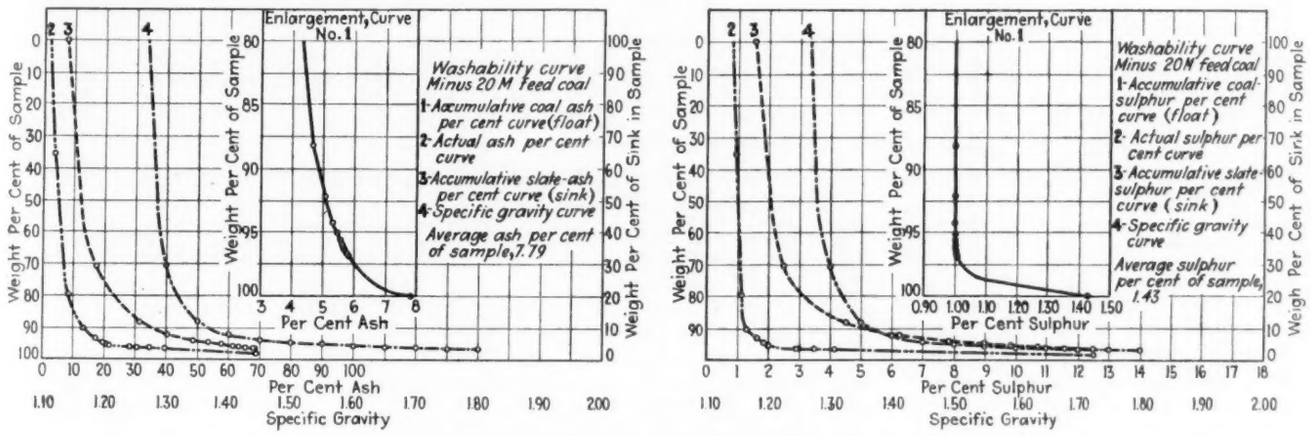
The disposal of refuse may be classed as an added objection to the use of washed coal due to the firing tendency when disposed of in piles or fills. The firing of the refuse is of considerable concern at Clairton, but, after a year of experimental work, sufficient progress has been made to give at least present relief. The 1½-in.x0 refuse as produced at the washing plant, when disposed of in any sizable piles or fills, heated up with the evolution of obnoxious gases and vapors, and in time fired. As a result of the experimental work on the pretreatment and methods of disposal two methods are now in use which apparently are meeting with success: the sluicing of the ⅜-in.x0 refuse into place with water, and the pulverization of the plus ⅜-in. refuse so that 90 per cent passes a ⅛-in. screen with disposal into piles without sluicing. Since middlings are not produced at the washing plant at the present time, the middling boot and bin are being utilized to recover the refuse from the coarse-coal plant separate from the refuse from the fine-coal plant.

From tests made on 6,000 tons of refuse, ⅜-in.x0, sluiced into place, there have not been any indications of heating up after a six-month storage period. When considering the packed condition of this sluiced material and the degree to which the fines have filled the voids in the larger sizes, it is felt that encouraging results have been obtained.

The pulverization and storage of the plus ⅜-in. refuse is even more encouraging; the rapid disintegration that takes place on the outer surface of the pile of this pulverized material causes a dense crust to be formed which it is believed will prevent the penetration of air into the pile, which would cause heating up or firing. This test is being conducted on a large scale and refuse is being added to the pile daily without any resultant rise in temperature.

Plans are being made for the installation of a hammer-mill crusher at the top of the refuse bin at the washing plant, where the over-all refuse will be received from the elevator and crushed as fine as the wet refuse will economically permit. Considering the results of the tests to date, it is believed that this crushed refuse can be either disposed of as prepared or at least by sluicing into place.

During the first fourteen months the coal-washing plant was in operation, 2,613,135 tons of coal was washed. Although economic conditions have been such that the operation of the coke works has been subnormal, it is believed that a fair comparison of results from washed coal with those from raw coal can now be made. Table VII shows the average comparative analyses and yields of coke from raw and washed coal.



Figs. 6 and 7—Washability Curves, Minus 20-Mesh Feed Coal.

Table VII

	Raw Coal Per Cent	Washed Coal Per Cent
Metallurgical Coke (plus 1¼ in.)		
Analysis:		
Sulphur	.92	.80
Ash	11.50	10.31
Yield	60.00	62.00
Fuel Index	80	91
Domestic Coke (1¼x¾ in.)		
Analysis:		
Sulphur	.92	.80
Ash	15.00	10.50
Yield	4.00	3.50
Coke Dust (¾ in.x0)		
Analysis:		
Sulphur	1.00	.83
Ash	19.00	12.83
Yield	6.00	4.00

The fuel index is calculated by an empirical formula from the strength, hardness and brittleness as determined from the tumbler barrel tests. This index shows a 14 per cent improvement in the physical quality of the coke produced from washed coal, a conclusion substantiated in blast-furnace practice. Increased strength of the coke from washed coal as compared with unwashed coal also is shown by the comparative yields of coke dust which is produced by the breakage in pushing and handling the coke preparatory to loading. By washing the coal, the yield of dust is reduced 2 per cent with a corresponding increase in yield of metallurgical coke. In addition to the improvements in the fuel index, a 1 per cent increase in porosity of the coke from washed coal is obtained.

The improvement of the physical qualities of the metallurgical coke, in addition to the reduction of ash and sulphur, has been reflected in blast-furnace practice to the extent of a 5 to 8 per cent reduction in coke consumption; a 5 to 10 per cent reduction in flux, with a subsequent reduction of 7 to 12 per cent in slag volume; a 5 to 8 per cent reduction in blast pressure, resulting in a substantial reduction in power requirements; and a 5 to 8 per cent increase in production of a lower sulphur pig iron. These improvements in blast-furnace practice, under the same operating conditions, were based on the average operation of five different plants which changed from coke made from raw coal to that made from washed coal.

The ash content in the domestic size coke is reduced to practically the same percentage as in the metallurgical coke, making this size a potential metallurgical fuel. In fact, at the present time, the domestic size coke is being shipped to the blast furnaces mixed with the metallurgical coke without apparent effect upon their practice. Increased fuel value is obtained likewise from the lower ash coke dust which is consumed as a boiler fuel.

The coking of washed coal shows an increased yield of byproducts comparable with the increased percentage of volatile matter resulting from the reduction in ash. A 20 per cent reduction of hydrogen sulphide is obtained in the gas from washed coal, which is important even under present conditions of consuming the gas without purification and will become more important should a gas purification plant be necessary, as the cost of removing hydrogen sulphide from gas is of considerable con-

Table VIII—Analyses and Float and Sink Test Data of Products from Coal Washing Plant

November, 1932

ANALYSES

	Moisture, Per Cent	Sulphur, Per Cent	Ash, Per Cent	Volatile Matter, Per Cent	Fixed Carbon, Per Cent	Tons Produced at Indicated Moisture
Raw Coal	4.47	1.11	8.62	32.17	59.21	172,468
Washed Coal	6.11	.99	7.33	32.92	59.75	171,619
Refuse (Over-all)	6.79	5.60	68.20	....	....	3,889
Filter Product	24.47	1.61	9.24	....	....	.....
Centrifugal Dryer	7.79	.94	6.33	....	....	.....

FLOAT AND SINK TEST DATA

Raw Coal

	Per Cent (Dry)	Sieve, Per Cent	Float 1.40 Per Cent	Float 1.40 Ash, Per Cent	Float 1.40 Sulphur, Per Cent	Sink 1.40 Float 1.55 Per Cent	Sink 1.40 Float 1.55 Ash, Per Cent	Sink 1.40 Float 1.55 Sulphur, Per Cent	Total Float 1.55 Per Cent	Total Float 1.55 Ash, Per Cent	Total Float 1.55 Sulphur, Per Cent	Sink 1.55 Per Cent	Sink 1.55 Ash, Per Cent	Sink 1.55 Sulphur, Per Cent	Head Ash, Per Cent	Head Sulphur, Per Cent
Plus ⅜ in.	....	65.50	96.36	7.30	0.93	1.34	23.15	2.14	97.70	7.51	.95	2.30	63.20	4.15	8.79	1.03
⅜x20 mesh	....	26.22	95.81	5.95	0.90	1.50	21.87	2.35	97.31	6.20	.92	2.69	63.57	5.96	7.74	1.06
Minus 20 mesh	....	8.28	92.08	5.60	1.05	3.77	16.62	1.68	95.85	6.03	1.07	4.15	56.72	12.49	8.13	1.55
Over-all	....	....	95.86	6.81	0.94	1.58	21.55	2.10	97.44	7.05	.95	2.56	62.43	6.06	8.47	1.10
Washed Coal																
Plus ⅜ in.	....	64.62	98.20	7.16	0.91	1.35	22.56	2.23	99.55	7.37	.94	.45	41.72	2.45	7.52	.95
⅜x20 mesh	....	23.21	97.65	6.12	0.91	1.72	21.90	2.21	99.37	6.39	.92	.63	40.62	3.89	6.60	.94
Minus 20 mesh	....	12.17	93.40	5.72	1.02	3.89	17.94	1.95	97.29	6.21	1.06	2.71	50.85	14.15	7.42	1.41
Over-all	97.8	....	97.49	6.75	0.93	1.74	21.15	2.15	99.23	7.00	.95	.77	45.44	7.76	7.29	1.00
Coarse-Coal Plant Refuse																
Over-all	1.2	See *Note	0.98	10.73	1.42	1.15	27.53	2.04	2.13	19.80	1.75	97.87	70.72	4.35	69.64	4.29
Fine-Coal Plant Refuse																
Plus 20 mesh	....	83.53	4.16	7.62	1.04	1.45	27.07	2.72	5.61	12.65	1.47	94.39	70.62	6.28	67.37	6.01
Minus 20 mesh	....	16.47	9.35	10.90	1.50	2.77	20.05	2.53	12.12	12.99	1.73	87.88	72.60	15.57	65.38	13.89
Over-all	1.0	....	5.01	8.62	1.18	1.67	25.13	2.68	6.68	12.75	1.55	93.32	70.93	7.72	67.04	7.31

EFFICIENCY

	3 in.x20 mesh Per Cent	3 in.x0 Per Cent
Qualitative	79.67	70.70
Quantitative	99.92	99.90

*Note: Sieve Test Coarse Coal Plant Refuse:

Plus ⅜ in.	91.99
⅜x20 mesh	6.75
Minus 20 mesh	1.26

Average Tons Per Hour Feed
703

All sieve tests were made on round-hole screens except refuse samples, which were made on square-hole screens.

sequence. An additional benefit derived from the washing of coal is that more of the top and bottom coal is being removed from the seam. An estimate of this increase in production at the mines is not available at this time.

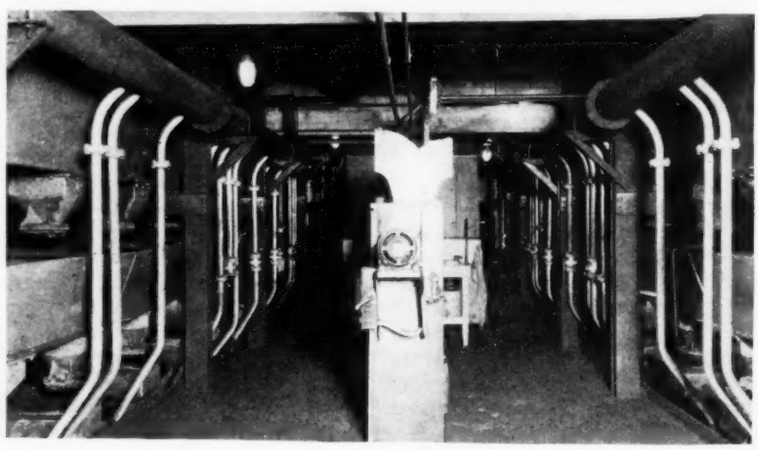
The following is a summary of the chief benefits derived from the washing of coal for coking purposes at the Clairton plant:

1. Reduction of the ash and sulphur in the coke produced.
2. A 10 to 15 per cent improvement in the physical qualities of the metallurgical coke produced as determined by the tumbler barrel test.
3. Decreased yields of small size coke with a corresponding increase of metallurgical coke.
4. Twenty per cent reduction of hydrogen sulphide content in the coke-oven gas.
5. Increased yields of byproducts comparable with the increased percentage of volatile matter in the washed coal.
6. Increased porosity of the coke.
7. Increased production at the mines due to removal of more top and bottom coal.
8. Improvements in blast-furnace operations due to improved quality of metallurgical coke.

These improvements in coke-oven products and blast-furnace operations are being made by washing coals which show a comparatively small reduction in ash and sulphur, and it is anticipated that a much greater relative improvement can be shown when washing inferior coals which would show a greater ash and sulphur reduction.

The writer desires to acknowledge assistance given in the preparation of this article by Frank Klingensmith, general foreman in charge of the washing plant; E. C. Auld, chief engineer, H. C. Frick Coke Co., and members of the chemical staff of the Clairton Byproduct Coke Works. The engineering and construction of the washing plant was by the Koppers-Rheolaveur Co., Pittsburgh, Pa.; fabrication and erection of building by the American Bridge Co., Ambridge, Pa.; foundations by the Carnegie Steel Co.

Rheolaveur Fine-Coal Plant and Free-Discharge Rheo Boxes.



TRENTON BOOSTS ANTHRACITE

+ By Sale of Automatic Equipment

Through Central Agency

SINCE February, 1932, twenty-four coal merchants of Trenton, N. J., have been engaged in a cooperative effort to promote the use of anthracite that may eventually serve as a pattern for other communities. Their efforts are given direction and force through the Anthracite Service Corporation, organized by the dealers to help anthracite and combat the inroads of fuel oil, gas and other competitive fuels by offering automatic anthracite-burning equipment and controls, such as stokers, blowers, thermostats and hot-water heaters, a heater cleaning service and expert advice on the operation of both automatic and hand-fired equipment.

Trenton is served by approximately 35 dealers, and prior to the formation of the Anthracite Service Corporation the 24 merchants participating in its organization were affiliated with the Trenton Coal Dealers' Credit Bureau. Two of these merchants held franchises for the sale of stokers, and aside from their efforts the promotion of automatic heat was largely in the hands of the service organization of the Anthracite Institute. The growing importance of automatic equipment as a means of holding and expanding the anthracite market convinced the members of the credit bureau that best results probably could be obtained through a central agency responsible for all phases of an automatic-heat program and operated for the benefit of the entire membership. Out of this belief grew the Anthracite Service Corporation, which was originally formed to carry on experimental work but has since taken on all the aspects of permanency.

The first five or six months of the corporation's life were devoted to the solution of organization problems and to the development of suitable objectives. Regular operation under substantially the present plan got under way in July, 1932. As now constituted, the corporation handles both the sale of automatic heating equipment approved by the Anthracite Institute laboratory and the service work of the dealers participating in the ownership of the organization. In addition, the corporation has taken over the work of the credit bureau, although the identity of the bureau has been retained.

Responsibility for the operation of the corporation rests in the hands of the manager, who directs the sales, advertising, service and credit activities. All of these center at the company's headquarters and showroom at 223 East Front St., where all the equipment handled by the organization is on display. In addition to the personal efforts of the sales personnel. the corporation carries on regular newspaper advertising and direct-mail work. Newspaper work is based on yearly contracts for space. Under the provisions of these contracts, the corporation is obligated to insert a minimum number of lines each week. Major campaigns, however, are reserved for June, July and August, in preparation for the start of the heating season, and in these months advertisements frequently run up to a maximum of one-half a page a week. In addition, the advertising program calls for the mailing of some form of direct-mail material every working day in the year.

All equipment, regardless of price, is sold either for cash or on time. In case the customer elects the installment plan, he is required to pay 20 per cent down, and is allowed up to 24 months to take care of the rest; the usual term is twelve months. A one-year service guarantee, covering defects in equipment or in installation, is given with each sale. Other service calls are charged for, and may come direct to the corporation or may be referred to it by the dealer, unless, as is seldom the case, the latter elects to do the job himself.

The corporation also has under consideration the introduction of the automatic-heat contract, but progress in this direction has been held up by difficulty in obtaining a fixed price for the necessary coal supply. An experimental janitor service in connection with stoker installations also is being offered at a flat rate of $1 per week. The charge as yet is nominal, and may be revised in the light of future experience. The service covers filling the hopper and removing the ashes.

Up to May 1, an aggregate of 40 stokers were sold by the corporation. As pointed out above, full-scale efforts began in July, 1932. Since that time, sales of this type of equipment have shown steady progress, and an especially favorable showing was made in the early months of this year, normally the off-season for purchases of this character. The corporation's program for the present year calls for the distribution of 100 machines. The 40 stokers sold to May 1 were allocated by the corporation as follows:

	Per Cent
Replaced hand-fired equipment	37.50
Replaced oil-fired equipment	8.33
Replaced gas-fired equipment	12.50
In competition with oil	37.50
In competition with gas	4.17

The Bengal automatic coal water heater, approved by the Anthracite Institute in November, 1931, is the latest type of equipment to be added to the corporation's list. This heater is fired with pea, and offers one means of building up the summer market. Its selection by the company was signalized by a city-wide sales drive, which began with a parade on May 6 in which all the dealers were represented by trucks. The equipment also was featured in display advertising in the newspapers, built around a reduction of 75 per cent in the cost of heating water with gas and a special introductory price of $49.50 to the first 100 customers. Regular price is $85. Public response to the campaign, which is being continued, is evidenced by the fact that 50 heaters have been sold since the start, bringing the total both before and after up to 60 machines.

TENTH ANNUAL MEETING

+ Of Practical Coal Operating Men

Draws Big Delegation to Pittsburgh

L. N. Thomas
National Chairman, Program Committee

LOADING mechanization has ceased to be an issue, to judge by the Tenth Annual Convention of Practical Coal Operating Men and National Exposition of Mining Equipment, held at the William Penn Hotel, Pittsburgh, Pa., May 8-11, under the auspices of the Manufacturers' Section, Coal Division, American Mining Congress, and that, not because it has run its course but because it has long proved its case and is now generally recognized as indispensable and a part of normal procedure. As funds become available, its rapid progress is inevitable.

Forty-three written articles and discussions were presented and three illustrated talks. About 2,682 mining men attended and about 800 exhibitors. The exposition and the hall in which the sessions were held were alike crowded. In the opinion of delegates, the Pittsburgh meeting was one of the most successful of these always important events.

At Monday's luncheon, which opened the meeting formally, and at which C. J. Ramsburg, Koppers Co., presided, short addresses were made by R. L. Ireland, chairman of coal division; by L. N. Thomas, national chairman of the program committee; E. W. Judy, vice-president, Harwick Coal & Coke Co.; Thomas Moses, president, H. C. Frick Coke Co.; and Ralph C. Becker, chairman of the Manufacturers' Section.

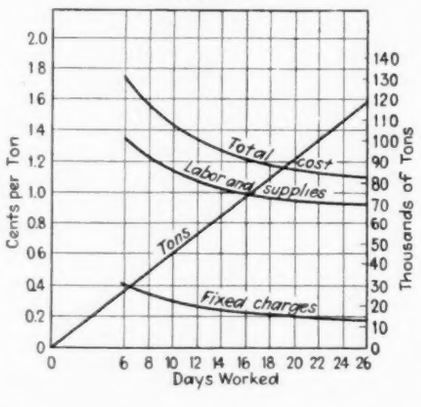
IRREGULAR operation makes it impossible at any mine to set up a uniform cost-per-ton "bogey" and meet it month by month. If enough coal is sold to keep the mine working several days a week, a bogey based on a normal run is readily surpassed, but if the market proves slack and the mine runs slow time, the bogey is entirely unattainable, said G. C. McFadden, assistant vice-president in charge of operations, Peabody Coal Co., at the opening technical session, May 8, presided over by W. L. Robison, president, Youghiogheny & Ohio Coal Co., in an address read by G. C. Crowder. He described the variable bogey used by that company and the manner of its computation. The figures, given in Table I and plotted in Fig. 1, were merely illustrative and not those actually used in preparing a bogey. Actual figures are obtained from operating data for each mine.

Table I—Variable Cost Bogey for Any Given Regularity of Operation

Days Worked	Tonnage	Labor and Supplies Per Ton	Fixed Charges Per Ton	Total Costs Per Ton
6	27,600	1.3384	0.4069	1.7453
8	36,800	1.2021	0.3379	1.5400
10	46,000	1.1200	0.2977	1.4177
12	55,200	1.0653	0.2664	1.3317
14	64,400	1.0263	0.2474	1.2737
16	73,600	0.9956	0.2306	1.2262
18	82,800	0.9742	0.2170	1.1912
20	92,000	0.9560	0.2050	1.1610
22	101,200	0.9410	0.1960	1.1370
24	110,300	0.9293	0.1873	1.1166
26	119,600	0.9184	0.1797	1.0981

Supplies are charged as they are used, so that every part of each operation will carry its proper material charge. Costs in one month are not compared with costs in the same month a year ago but with costs in a month with equal running time and with those of this table, which is termed the "anticipated budget." With the anticipated budget chart and table before him, the sales manager can see, for instance,

Fig. 1—Cost Charted Against Days Worked



just what will be the additional cost of producing 40,000 more tons than contracts already provide and can figure at what price he can afford to take on that tonnage.

Each mine is divided into sections under a section boss who is responsible for the costs in his section, except those covering haulage and ventilation. Tonnage is kept by sections so that each section boss' cost per ton can be ascertained. Each foreman fills out his own time sheet.

To get the figures for anticipated cost, said L. W. Householder, vice-president and general manager, Rochester & Pittsburgh Coal Co., involves formulation of a detailed scheme of operation, based on a carefully prepared map, which shows just what headings are to be driven, what rooms are to be advanced and what pillars are to be extracted. The assistant foremen, division engineer, mine foreman, superintendent and general superintendent must plan the operation and prepare the budget.

That doesn't mean paring the service to miners to the bone. A wise management realizes that the object of running the mine is tonnage, and if the miner does not get adequate service, the section foreman will get too low an output from his section over which to spread his service costs. The more tonnage, the more service he can pay for, and the more service, the greater tonnage he can get.

Trackmen and bratticemen must have everything needed for their work. They must be taught to ascertain this before starting to any job, and must be taught to gather up their tools and surplus supplies and bring them out with them when the job is finished. By concentration of the men, a minimum of service labor is required. In case a man's place is not available for some

J. T. Ryan

reason, other places must be provided. Foremen criticize their section bosses if they do not have places for such temporarily dispossessed men. No matter how slack the run may be, absenteeism without due cause is regarded as an offense, because it destroys efficiency, and when the full quota is not present arrangements must be made to maintain tonnage.

Room-and-pillar methods and a 45-deg. break line have given the best results at the Pond Creek Pocahontas Co's. mines, according to R. E. Salvati, manager. There are seven headings on the main entry at 50-ft. centers; flats are driven with six headings; and room entries with four headings, the first at 60-ft centers and the second at 62-ft. centers. Each entry has 25 rooms, and a 200-ft. side pillar is left to protect the flats. The rooms are driven at 62-ft. centers and 16 to 18 ft. wide.

The first five rooms are driven their destined length before a start is made on the removal of the pillars. Except for this short delay, which, of course, is perpetuated throughout the pillar drawing, no rooms are allowed to stand. Thus, track never has to be reset, and no falls have to be cleaned up. Cover ranges from 350 to 1,100 ft. The bottom is a hard slate. In extraction, a crosscut is driven 16 ft. wide across the pillar, leaving a 10-ft. stump against the break line. From 90 to 95 per cent of the coal is extracted. The 10-ft. pillar is left only until the crosscut is completed, and practically all of the pillar is recovered. Sometimes, the pillar is worked at the end instead of by a crosscut. In this case, the 10-ft. pillar is replaced by two lines of 6-in. posts at 4-ft. centers, with the posts in one line staggered with those in the other line. Each post has a heavy cap.

Standardized timbering has proved its value at the Dehue mines of the Youngstown Mines Corporation, said E. B. Agee, superintendent. But entries are driven on 300-ft. centers in the 62-in. Eagle seam, mining of which is made difficult by the presence of drawslate running from zero to 5½ ft. in thickness. Seven standard sizes of timber are used for posts, ties and caps. Round posts are of 6-in. diameter; half posts are cut from 9-in. timber; quartered posts measure 6x6 in.; and split posts, 6 in. on all three sides. Wedges measure on the horizontal plane 6x18 in. and are 1½ in. thick at one end and ⅛ in. thick at the other.

Oil has proved more economical and efficient than grease in lubricating Joy machines, said G. S. Jenkins, mechanical engineer, Consolidated Coal Co. of St. Louis. Since 1928, that company has reduced lubricating costs from between 1.5 and 2c. per ton to 3 mills.

Its experience has been that oil has a greater viscosity than grease at operating temperatures, and, with oil, the machines are practically new after many years of operation. A repairman and two oilers go around at night and attend to repairs and lubrication. A pound of lubricant was used for every 15 tons of coal loaded, or a gallon of lubricant for approximately every 120 tons. In order to see whether the machines leak and spray lubricant, they can be run over paper.

Close surveillance and substitution of oil for grease as a lubricating medium have made important reductions in operating costs on Joy machines at the Pittsburgh Coal Co's. mines, said T. N. Gray, superintendent of mechanical equipment.

Many accidents come from fellow employees' acts and the miner cannot well prevent the carelessness of those with whom he is working, said T. F. Christian, general superintendent of mines, West Kentucky Coal Co. In 1930, the cost of compensation was 2.22c. per ton. By an active campaign this had been reduced to 1.64c. in 1931 and to 0.77c. per ton last year. At one time, the company had mined 3,000,000 tons without a fatal accident till a mule broke the record by fatally kicking a man.

Nine hundred shaking conveyors are in active use in the anthracite region; the number has increased by 300, or 50 per cent, in the last twelve months, declared J. McCrystle, chief engineer, Wyoming Valley Collieries Co. Of these, most are of 20-ton-per-hour capacity and driven by 7½-hp. units.

Improvements in design, construction and material have made it possible to extend the trough lines to as much as 650 ft., as against the 300 ft. ordinarily used. Some of these long lines have six or seven swivels, facilitating the following of winding pillars. Swivels are designed permitting a maximum swing of 22½ deg. to the right or left, but, for insertion in the pan line, as distinguished from use at the face, swivels will stand up better in service if the angle is restricted to 15 deg. or less, an additional swivel being inserted where large angles are needed. A shaking conveyor replacing all-hand operation usually will pay for itself in less than six months if continuously operated.

Channel analyses, said Carl Scholz, consulting engineer, Charleston, W. Va., in a paper read by C. A. Gibbs, general manager, Harwick Coal & Coke Co., have lost their commercial standing. What the purchaser wants to know is the analysis of the particular size he expects to buy. In Mr. Scholz' belief, what was wanted was car samples taken by a laboratory, name given, and results published by some reliable authority. The dust content—coal passing through a 40-mesh sieve—should be supplied for the fine sizes.

W. L. Robison

J. T. Ryan, Mine Safety Appliances Co., Pittsburgh, Pa., was elected chairman of the Manufacturers' Section, Coal Division, American Mining Congress, at the meeting of the section at Pittsburgh on May 10; G. R. Delamater, W. S. Tyler Co., Cleveland, Ohio, first vice-chairman; C. B. Officer, Sullivan Machinery Co., Chicago, second vice-chairman; and B. G. Shotton, Hendrick Manufacturing Co., Pittsburgh, third vice-chairman. Charles Whaley, Myers-Whaley Co., Knoxville, Tenn.; Milton Duff, Phillips Mine & Mill Supply Co., Pittsburgh, and Frank E. Mueller, Roberts & Schaefer Co., Chicago, were elected members of the board of governors of the section.

OVER 20 per cent of the owned homes in Illinois now use oil for heating; replacement of coal by oil in the Central West has cost Illinois mines

10,000,000 tons of production per annum, declared B. R. Gebhart director of public relations, Illinois Coal Bureau, at the Tuesday (May 8) morning technical session, presided over by R. H. Morris, general manager, Gauley Mountain Coal Co. Fifty-nine cities in Illinois, Iowa, Minnesota, Missouri, Nebraska and South Dakota now use natural gas industrially to the equivalent of 4,622,250 tons of coal annually, and a loss of 4,000,000 more tons of coal in 185 cities is threatened. These figures show the desperate need for collaboration between mining and combustion engineers, to the end that a product may be offered the public whose form value adapts it to economical, convenient and thoroughly satisfactory use in modern fuel-burning devices.

In Chicago, coal, properly applied in a modern plant, costs half as much as oil and a third as much as gas. As an actual example, two Chicago hotels recently made tests of several weeks' duration with coal and oil. The coal cost $5.15 per ton and the oil 4⅜c. a gallon. One hotel found coal cheaper by 36.1 per cent, and the other by 43.3 per cent; both now burn coal exclusively.

Engineers are constantly seeking improved methods of drying fine coals after wet washing, declared F. A. Jordan, Youngstown Sheet & Tube Co.

It has commonly been thought that the coal with the largest percentage of water should receive the washery superintendent's most careful attention, but Mr. Jordan contended that he should use his every care to extract the water that can be removed at least cost per pound of water removed. Perhaps he should not dry the wettest of the coal. Mr. Jordan presented Table III to show what he meant.

Operating cost, actual and estimated, includes only operating labor, repair labor, materials and renewals, power and lubrication. The figures in the lower part of the table are estimated costs only.

Dedusting as practiced by the Chicago, Wilmington & Franklin Coal Co. (see *Coal Age*, Vol. 37, p. 271) was described by Thomas Garwood, engineer, of that company. What to do with the product is a problem the operator must solve, said H. F. Hebley, Allen & Garcia Co., Chicago. In Germany, twenty plants are using what would be equivalent in America to a minus 78-mesh coal, without grinding. The volatile matter in the coals burned varies from 12 to 28 per cent yet the efficiency of combustion is approximately 80 per cent. In the Halle district aspirated coal is being used on locomotives without preparatory grinding.

R. H. Morris

Recent and new cleaning, drying and aspirating methods of coal treatment were described briefly by J. B. Morrow, preparation manager, Pittsburgh Coal Co. One system used a table with air blown up through the coal by orifices and refuse removed through star gates. He also described the Slater air jig, with a deep coal bed kept mobile by air, both refuse and coal being withdrawn by similar gates. Two processes used a heavy-gravity chemical fluid with ingenious arrangements to avoid the loss of the chemical. Some loss of calcium chloride, where that was used, was not greatly to be deplored, he declared, for the chemical retained by the coal was desirable wherever it was already being used to render coal dustless. He also described the Turbo-Clone rotary dust collector (*Coal Age*, Vol. 38, p. 139), now under test at the Montour No. 10 plant of the Pittsburgh Coal Co.

Tradition, said C. D. McLaughlin, general superintendent, Pioneer Coal Co., Kettle Island, Ky., is the greatest objection to the use of the coal saw. The Straight Creek seam, which is rather hard and has well-defined faces and butts, is being mined at the Pioneer mine. The seam has a good roof, sometimes of sandstone. The coal sticks to the floor, making it unusually hard to "scrap."

Two Joy saws were purchased, and on finding they worked satisfactorily, three more were added and all five are being worked on a 24-hour basis. Five have been placed in another mine, which is operating in the Harlan seam, with most encouraging results. Maintenance cost on these saws is negligible. The coal at the Pioneer mine parts readily from the roof and does not need to be cut loose. In using these machines, no key block has to be pulled free of the face before removing the rest of the coal. The coal is not shot but is dislodged solely by the use of the saw.

A large reduction of ash is effected because the rash over the coal does not mix with the product. An output per saw of 180 tons per 8-hour shift is obtained. Two men operate the machine, and one helper is stationed at the car. The coal costs about 1c. more per ton than before, but the coal is easily loaded and has more and larger lumps. Table III shows the size realization before and after the Joy saws were introduced.

Table III—Sizes of Coal When Shot and Sawed

Size	Shot Coal Per Cent	Sawed Coal Per Cent
4 in. and over (lump)	35	66
2x4 in. (egg)	15	9
0x2 in. (nut and slack)	50	25
	100	100

Safer working conditions resulted from the operation of the saws. The introduction of the equipment had not displaced any labor but had greatly increased sales realization.

In answer to A. L. Barrett, electrician, Pittsburgh Coal Co., Mr. McLaughlin said that maintenance was less costly with Joy saws than with cutting machines. Fifty per cent more cutting had to be done with the saw than by the combined use of ordinary cutting machines and explosives. In reply to Frank Kain, Jr., preparation manager, Youghiogheny & Ohio Coal

Table II—Cost of Drying Coal of Various Sizes by Different Means

(1) Obtained Cost With Present Equipment

Sizes to be Subjected to Drying	Total Percentage of Solids by Weight	Means by which Coal is Dried	Percentage of Moisture in Product	Actual Operating Cost Per Ton Heat Dried
—4 to +¼ in.	63	Shaking Screen	3.0	$0.0061
—¼ in. to +48 mesh	31	Carpenter Dryer	7.0	0.0297
—48 mesh	6	American Filter	22.0	0.0877
—4-in. coal	100		5.38	$0.0183

(2) Estimated Costs of Drying by New Methods

Sizes to be Subjected to Drying	Means by which Coal is Dried	Total Percentage of Solids by Weight in Received Coal	Percentage of Moisture in Dried Product	Additional Operating Cost Per Ton Heat Dried	Cost of Heat Drying Per 100 Lb. of Water Removed	Total Operating Cost Per Ton of Coal Delivered
—4 to +¼ in.	Shaking Screen And D.L.O. Dryer.	63	2.2	$0.0043	$0.0269	$0.0104
—¼ in. to +48 mesh	Carpenter Dryer	20	7.0	.....	.....	0.0297
	Carpenter Dryer and Kiln Dryer..	11	3.0	0.0700	0.0875	0.0997
—48 mesh	D.L.O. Dryer....	6	6.0	0.1460	0.0456	0.2337
		100	3.48	$0.0192	.....	$0.0375

Co., Mr. McLaughlin declared that the slack from the saw was not finer than that from an ordinary coal cutter and that there was less of it because the kerf was only 1¾ to 2 in. wide. Increased tonnages of coal had been loaded.

A machine bit should be hard enough at the cutting edge to resist abrasion, tough enough to withstand severe shocks, and should have a shank soft enough to allow the setscrew to take hold without injury to itself, said James Hyslop, assistant superintendent, Dresser Mine, Walter Bledsoe & Co. Ordinary 0.70- to 0.90-per cent carbon bit steel, if properly heat-treated, will develop all of these properties.

The high-temperature hardness of the high-speed bit is of no value in the cutting of coal. The bit not only has a hard shank, which is destructive to setscrews, but is hard to forge. Its cost also is prohibitively high. Hard-surfaced bits are expensive to make, they are dead soft, and therefore readily susceptible to a distortion which, bad in itself, will also cause the brittle surfacing metal to break off. Hard-surfaced bits may be less objectionable for soft than for hard cutting, but Indiana coals generally are difficult to cut and require machine bits having brute strength. Such bits can be made by the proper heat-treatment of ordinary bit steel.

Bits are heated in an oil-fired Sullivan furnace and forged in a Sullivan roller. By allowing a definite period to elapse between the forging of the bit and its quenching in oil (about 15 seconds), the bit can be suitably hardened by the forging heat. The necessary time delay is obtained by allowing the bits to be carried on a chain conveyor from the roller to the quench. The hardened bits are taken out of the oil and tempered by immersion in a bath of fusible salt at a temperature of about 575 deg. F. They are left in this bath for 15 minutes and then air-cooled.

Cutting in the rocky No. 5 seam, which is 4 ft. thick, requires about 1.06 of these bits per ton, about 50 per cent as many as were required when the untreated bits were used. The dulled bits are now in much better condition than they used to be. In fact, before the system was adopted, about 300 bits per day were so badly bent that they had to be straightened before rolling; this number has been reduced to 2 bits per day.

No additional labor is required by the method and two men can sharpen 500 bits per hour. The bit-sharpening cost per thousand tons dropped from $6.16 to $4.22, though the sharpening cost per thousand bits was increased from $3.08 to $3.98. The chief advantages are realized in the mine; among others, 50 per cent less time for bit setting, improved cutter-chain life and lower power cost.

Carl Lee said that this method of tempering had proved effective at the Peabody Coal Co.'s mines, and Mr. Barrett remarked that Pittsburgh Coal Co. had found that a treatment of this kind gave the tip a hard edge, annealed the shank satisfactorily and doubled the life of the bits.

BETTER sales realization, increased safety, sounder roof and ribs, less noxious gas, absence of irritation to the noses, throats and lungs of men in the mine, less coal dust in air to form an explosive deposit in return airways follow the use of Cardox, said C. J. Sandoe, vice-president, West Virginia Coal Co. of Missouri, at the afternoon session, presided over by J. A. Long, general manager, Woodward Iron Co. The St. Ellen mine of that company, O'Fallon, Ill., is using this explosive, and finds that, as it breaks the coal along the natural lines of cleavage by a gentle action, the coal seems actually cleaner and brighter. Though the quantity of 3x2- and 3x2½-in. coal has not sensibly changed, 19 per cent more lump coal is obtained and less 2-in. screenings. The freedom of roof and floor from the injurious strains induced by more violent explosives, said Mr. Sandoe, has increased safety. Only one man has been injured.

J. A. Long

Three improvements devised by the Jeddo-Highland corporation were described in a joint paper of Donald Markle, president, and A. B. Jessup, vice-president, Jeddo-Highland Coal Co., read by J. Kildare of that company, viz: (1) the compressed-air valve noted in *Coal Age*, Vol. 37, p. 400; (2) the container to promote economical handling of coal and freedom from breakage and pilferage, described on p. 210 of this issue; and (3) a domestic stove designed to furnish facilities for cooking and house heating; see *Coal Age*, Vol. 37, p. 418.

Methods by which main-line haulage efficiency has been improved at the fuel operations of the Chesapeake & Ohio Ry. Co. were described by L. E. Grant, superintendent, Eunice, W. Va., Creosoted ties have been used since 1928. These are as good as when first placed. A 50-lb. rail has been found of satisfactory weight where, as at Eunice, the alignment is good, ties are in condition and the track is well ballasted. An inspection car with two headlights is used to make periodic inspections of the track.

Motormen report on the condition of their locomotives every week. Car deliveries are scheduled so that the miner will know just when he will receive cars and can regulate his operations accordingly. The number of cars in each locomotive trip is rigidly restricted to the number the locomotive can be depended on to pull with an economical speed, without sliding of wheels, overdraft of current, excessive wear and delays. Circuit breakers are installed on all mainline locomotives. Trips are dispatched; a good dispatcher saves his expense several times each day, said Mr. Grant.

Brakemen must repeat orders word for word to see that they have fully understood them. This leaf from the railroad man's book has proved as valuable at the mines as in railroad service. All cars are designated with large numerals that can be read at a distance. If car *222* has a loose bumper or bad brake, the fact is reported by the brakeman to the dispatcher, who can arrange to send it to the shop. The dispatcher knows how many cars are shopped and how many cars he has available for loading. Dispatching has reduced the time during which cars are at the tipple 33⅓ per cent. Cars have a very variable turnover; one car may go to the tipple three times in a day and another only once in two days. This fact gives a clear indication of the delays in car service.

Minus 48-in. mesh coal, said H. W. Seyler, chief chemist, Clairton Coke Works, Carnegie Steel Co., is a desirable part of a coke-oven charge, if the coal being coked tends to shrink very much in the process, and if this fine coal is not so high in sulphur and ash as to raise unduly the percentage of both. Several years ago an investigation was made at Clairton with the object of improving the quality of coke produced from unwashed Klondike coal, which has a high percentage of volatile matter and tends to make "fingery" coke. Approximately 25 different inert materials including coke dust, screened granulated slag, limestone, blast-furnace flue dust and sand, were used to reduce the tendency of the coal to shrink.

Improvement in the physical condition of the coke was noted only when the size of the inert material did not

exceed 20-mesh and proved most beneficial when the inert material would pass through a screen between 20-mesh and 100-mesh. All of the minus 20-mesh inerts investigated improved the physical quality of the coke when used in quantities not exceeding 8 per cent, the percentage depending somewhat on the nature of the inert material used. The best was 6 per cent of minus 20 mesh coke dust. Fine coal up to 10 per cent improved the strength, hardness and size of the coke, but not in the same degree as inert materials. From these investigations, it would appear that the inerts contained in minus 48-mesh coal should have a beneficial rather than a detrimental effect on the physical structure.

Unfortunately, the addition of the sludge raises the percentage of ash 0.31 and the sulphur 0.04 per cent, but it is doubtful whether an increase of sulphur from 0.76 to 0.80 per cent is harmful, because the slag volume required for other conditions in a blast furnace will take care of the sulphur in the coke, though, with 0.90 to 1.00 per cent sulphur, the increase of sulphur due to the use of sludge might not be desirable.

Particles larger than minus 20-mesh tend to form hair fractures in the coke. A test of a 21-ton charge of 3-in. x 48-mesh washed coal with 8 per cent of minus 48-mesh sludge added decreased the minus 1-in. coke from 1.3 per cent to 1.0 per cent, increased the strength from 67.4 to 75.9 and the hardness from 68.7 to 72.0, decreased the brittleness from 55.7 to 51.0 and increased the fuel value from 72.0 to 87.0. In the shatter test, the minus 1-in. coke was reduced from 8.25 to 7.50 per cent. On analysis, the ash content had increased 0.32 per cent and the sulphur percentage 0.04.

Removal of minus 48-mesh material would have little effect on the fusion temperature of the ash at Clairton, said J. R. Campbell, bituminous representative, Koppers Rheolaveur Co., Pittsburgh, Pa. The ash-fusion temperature of the sludge ran between 2,100 and 2,200 deg. F. The low-temperature fusing ash in the sludge will lower the fusion temperature of the ash of the entire coal only imperceptibly; actually 90 deg. F. The objection to low-temperature fusion in the ash of sludge arises from the fine coal, therefrom resulting, being lifted by the air current as the latter passes through the grates. This dust then settles on the furnace walls, where it slags. It might be well to dedust the coal prior to cleaning, if the sludge has a slagging tendency.

Progress in the manufacture of explosives was described by C. Stewart Comeaux, secretary, Institute of Makers of Explosives, New York City, in a paper read by A. W. Dickinson, taxation expert, American Mining Congress, Washington, D. C. He noted that, as result of research, the lump-producing characteristics, economy and safety of permissible explosives have been increased and the use of such explosives

W. J. German

has in consequence been augmented. Today, some classes of high-count permissibles are cheaper than pellet powder. Cartridges can now be obtained of 1¼x 8-in. size running from 92 to 250 per box of 50 lb. These bulky explosives with a high count per box throw down the coal with a gentle action, making a large percentage of lump coal.

GENERATION and utilization of power have made great progress since 1910, when cylindrical boilers began to make way to more modern types of equipment, according to a paper by Paul Sterling, mechanical engineer, and E. Schweitzer, fuel engineer, Lehigh Valley Coal Co., and read by Mr. Sterling at the Wednesday morning session, presided over by W. J. German, general superintendent, Pocahontas Fuel Co. The grinding of anthracite is more difficult, said the authors, than its combustion when ground.

Steam should be used direct for the concentrated load near the generating plant, but electric drive should be adopted for isolated units. Steam lines would be welded and properly insulated. Some plants are both generating and buying power, but such mixed plants are not as economical as those where the power is either all generated or all purchased, declared the authors.

"It's just too bad," remarked Mr. German, "that superintendents cannot be compelled to get their power by requisition. They get everything else that way, but they draw power from the lines as and when they will. It comes only too easily and they waste it." All lines should be metered. Lines are extended in all directions by unauthorized persons. One may find a line that clandestinely has been extended to a still on the mountainside.

A load dispatcher, said E. R. Price, superintendent, Inland Steel Co., Wheelwright, Ky., is employed at one of the mines over which he has supervision. Tracks are bonded with O-B 18 short copper-weld bonds. Transformers are cut off when not in use. As a result of not overworking motors, of due care in inspection and of maintaining the required voltage at the point of use, only one armature has failed at Wheelwright in 20 months. At some operations, demand limiters are used which close at a predetermined demand. At others, every house in the mine village has its meter. One plan saved 21 per cent by economies which such meters caused to be put in force.

A tunnel cutting a steep 350-ft. fault was driven in 1932 at a cost of only $17.50 per linear foot in the mines of the Union Pacific Coal Co., said O. G. Sharrer, superintendent in charge of the Rock Springs Division, in a paper read by Mr. Dickinson in the author's absence.

To make rapid headway, a Joy 5-BV loader was used. A permanent track was laid as the tunnel progressed, so as to save the expense of relaying ties and rail. The tunnel was triple-shifted with three crews each of three men. The roof was sustained by Sullivan jacks on 2-in. pipe which in turn supported heavy cap pieces set at an angle of 45 deg. to the direction of the track and were arranged to project over the roadway. Of the entire 1,280 ft. of tunnel, 850 ft. had to be timbered.

Sixteen 8-ft. holes were drilled in the face of the heading. Little trouble was

Table IV—Number and Capacity of Power Units in Use in Anthracite Region of Pennsylvania

	Boilers				Steam Engines		Electrical Units			
	Cylindrical		Tubular				Generators		Motors	
Year	Number	Horsepower	Number	Horsepower	Number	Horsepower	Number	Kilowatts	Number	Kilowatts
1930	19	1,625	1,662	369,744	2,843	450,482	385	193,807	9,971	632,092
1920	59	3,905	2,579	480,733	5,555	715,366	417	98,573	.....	.....
1910	649	25,388	2,887	494,724	6,325	650,031	233	.....	.....	.....

	Haulage Units				Pumps		Air Compressors	
		Locomotives						Cu.Ft.
Year	Mules	Air	Steam	Electric	Number	Gal.-per-Min.	Number	Per Min.
1930	8,348	75	560	2,387	3,511	2,656,707	478	377,533
1920	11,062	103	665	1,709	3,235	2,022,806	295	.....
1910	.....	142	552	568	.....	.....	...	.....

experienced in operating the loading machine, though the hard conveyor chains wore badly in the handling of sandstone, and the equipment had to be entirely rebuilt at the conclusion of work. The work was done by regular Joy operatives, who proved quite equal to their new duties. Two lost-time accidents happened, both slight bruises, due to rock rolling down the pile. The tunnel cost $22,059 and involved the removal of 5,120 cu.yd. of material,

T. J. Thomas

handled at a cost of 63.4c. per cubic yard. This includes all operating and supply costs, all timbering, temporary and permanent; permanent track and trolley wire, and all rock transportation and disposal, with the cost of reconditioning the loading machine. Joy operatives were paid $7.20 per day; Joy helpers, $6; other inside labor, $5.42; and outside labor, $5.44.

"Issuing instructions is easy, but instructing men is difficult," declared James H. Pierce, consulting engineer, Scranton, Pa. Because of the variety of men brought up in different countries under many forms of discipline, because of the inherent difficulties in mining in the anthracite region, due to the variety of geological conditions, the pitching of the seams, the age of the workings, the rushes of imperfectly held coal, the incursions of water and the difficulties in the way of close supervision, the payment by car instead of by ton and the consequent difficulty in obtaining clean coal, discipline is particularly important in anthracite workings. To get such discipline, competent instruction and firmness with kindliness are needful.

Several methods of placing and gathering cars behind machines were described by D. W. Jones, superintendent, Valier Coal Co. Reel locomotives, said T. F. Whalen, Jr., general superintendent, Pittsburgh & Erie Coal Co., are too slow for gathering operations. He preferred and used storage-battery equipment. Coal was loaded at his mines in 3½ ton cars.

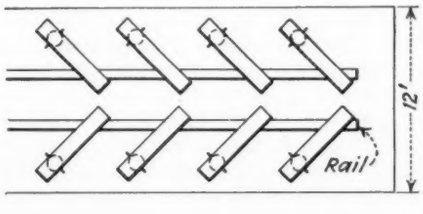
PAYING bonuses, or "safety dividends," as the company prefers to call them, to bosses for safety has brought results, said T. E. Lightfoot, engineer in charge of accident prevention and compensation, Koppers Coal Co., who opened the discussion at the afternoon session, presided over by T. J. Thomas, Valier Coal Co. Considering the short time between safety dividend periods, luck plays a part, since a boss with a carelessly kept section might draw a prize, despite its inherent lack of safety, because no accident happened to occur. Each section, therefore, is carefully inspected to see if any of 37 substandard conditions listed on a rating sheet are to be found. If the section rates 80 per cent perfect, and has for one month no compensable accident and not more than two lost-time accidents which are non-compensable, the boss receives a dividend.

A section boss cannot get a new rating for his section till the next periodic investigation, which occurs about two months later. A fatal accident prevents the mine foreman from getting any safety dividend during the month in which the fatality occurs. Samples of substandard conditions are track with splice bars having only three bolts where four are required and posts 4 ft. 1 in. apart where the required spacing is 4 ft. Each man is given a combined certificate and a check, additional to his regular pay. He retains the certificate to show his friends or hang up on the wall. Both inside and outside foremen participate, the maximum dividend for inside foreman being $15 and for outside foreman $7.50.

Morris Coulter, engineer, safety and inspection, Clearfield Bituminous Coal Corporation, Indiana, Pa., described the provision of prenatal instruction for mothers and child clinics for babies in good health, from which latter unhealthy babies are excluded because these are properly left to the doctor's care. The mothers bring their children to these clinics.

Chutes in the mines of the Lehigh Navigation Coal Co. drop the coal a distance of 5 ft. from the lip of the chute to the bottom of the mine car, said J. S. Miller, director of research.

Temporary Timbering, Hanna Tunnel



Much of the coal and the rock which often accompanies it is so large that pieces frequently weigh a ton or more, the shock of this falling material loosening the bolts of ordinary cars and ultimately wrecking them. Acid mine water, flowing with the coal out of the chute, adds to the destructive influences.

Three types of cars are used: a flat-bottom type with a capacity of 114.87 cu.ft. level full, a bathtub-bottom type with 131 cu.ft. capacity, also level full: and one of flat-bottom type which, with

P. C. Thomas

topping, has a capacity of 120 cu.ft. Each of these cars weighs 4,625 lb., has a length over bumpers of 9 ft. 4 in. and a body length of 7 ft. 7½ in. Their width is 5 ft. 1⅛ in. and height 2 ft. 11½ in. in the body and 5 ft. 0⅜ in. above rail. Gage is 3½ ft., and wheel diameter, 20 in. The bathtub-bottom car has a solid-cast steel underframe, bottom and pedestals and special alloy wheels. With axles and roller bearings it costs about twice as much as the older car with wood underframe, wood body, lined with sheet-iron, and equipped with plain bearing and the usual running gear.

To meet the shocks and acid water, wood cars have given place to the semi-steel car, the fabricated steel car, the skeleton cast-steel underframe, a similar underframe with car bottom and pedestals as a unit, an electrically welded underframe with welded bottom and pedestals as unit, and finally to the present car with concave or bathtub bottom in which cast-steel underframe, car bottom, pedestals, draft and bumper housing are cast as a single unit.

Structural steel underframes with fabricated bodies of steel gave good service till the rivets stretched and loosened, enlarging the rivet holes and allowing mine water to corrode the rivets.

Some of the earlier types of skeleton

frames have been removed from service because of damage in wrecks and from loose drawheads. Cast-steel underframes, if they should develop cracks, which is very rare, can readily be welded electrically. Solid-bottom cars reduce maintenance expense, increase availability for service, lengthen car life, eliminate fine-coal leakage, preserve wheel and axle alignment, prevent corrosion, and decrease number of parts.

Manganese-steel wheels, special alloy cast-iron and some cast-steel wheels and special axles are used. Some of the special steel wheels cost 250 per cent more than ordinary cast-iron wheels, but after five years of service show no signs of wear. Special alloy cast wheels which cost 50 per cent more than ordinary cast-iron wheels have been running three years without failure. Special steel axles with 150,000 lb. tensile strength and 120,000 lb. elastic limit, which cost two or three times as much as the ordinary steel axles, after six years are still in good condition. Integral underframes, pedestals and bottom plates with spring-draft gear and mechanical brakes, all form an excellent investment, as they have reduced cost of repairs 50 per cent and eliminated delays in transportation.

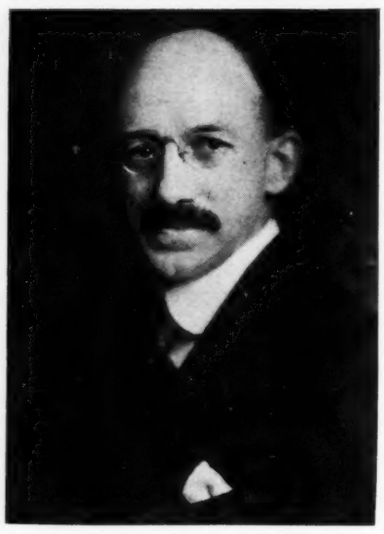
Seventy-five strip pits produce 25 per cent of the coal obtained from the 700 mines operating in the West Central district, said C. Y. Thomas, mechanical engineer, Pittsburg & Midway Coal Mining Co., Pittsburg, Kan. Natural gas is delivered to industrial plants at 7 to 16c. a thousand cubic feet and oil at much less than $1 per barrel.

These rival fuels, however, make competition difficult unless the coal is mechanically cleaned. At one mine, the Wuensch differential-density cone separator is being used for cleaning, and the 0x$\frac{3}{4}$-in. coal is dried by a D-L-O dryer which reduces the percentage of water from 12 to 4 per cent. The coal is light; 53 per cent of the 0x$\frac{3}{4}$-in. coal will float at 1.30 specific gravity. Froth flotation has been tried at one mine for two months, but has not been put into commercial operation. Aspiration does not appear promising, for the uncleaned product will run 24 per cent ash and the moisture in the coal from the pit varies.

Mechanics and electricians at the mine frequently requisition repair parts under wrong names, said R. G. Pfahler, mining engineer, Berwind-White Coal Mining Co., speaking for E. J. Newbaker, vice-president in charge of operation. This results in the receiving of the wrong items with accompanying loss and costly delay. Such mistakes in requisitioning have been corrected by supplying these men with forms containing the correct designations of all parts. They show the numbers of such parts ordered in the current and in past years, so that information on past and current requisitions is available.

Some of the mines, of course, are still obtaining satisfactory service from equipment that is no longer standard with the company. Stocks of parts for such units are not kept at the main storehouse but at the mine at which such equipment is still being used.

The equipment which one man can keep in adequate repair was determined by assigning a section to a competent man. The size of the section was increased to the point where it contained as much equipment as he could keep in good repair without help and without working more time than the mine worked; this established the standard section.



E. A. Holbrook

No distinction is made between electrical and mechanical work, the electricians doing the maintenance work having been trained to take care of the mechanical and electrical parts of the machinery under their supervision. A school is conducted in which electricians are given the practical training they require to do this work.

Cards are provided at the mines of the Pittsburgh Coal Co., said J. C. White, production engineer, to keep close track of the life of machine parts and the costs of repairs. These details can be assembled readily from the reports made by the mechanicians and storekeeper and are made applicable to each particular machine. Such details were already being collected by several departments for their own convenience. It was an easy matter to arrange the routing of the reports and the distribution of copies of the findings, so that making these records prevented time-consuming duplication and triplication and actually resulted in no extra labor and even some saving of time. Graphs are drawn in the general office for the repair costs of all kinds of equipment.

Group incentive systems, said E. J. Christy, consulting engineer, Wheeling Township Coal Mining Co., Adena, Ohio, have been established at the mines of that company. All men in a loading section except switchlayers are paid in definite percentages of the tonnage of the group in which they work. Thus all the men profit by any increase of tonnage and not only those engaged in actually loading coal. Men in any loading section, therefore, know that they will be paid for any useful labor they perform, not only when working on their designated jobs but in helping others perform their appointed work; thus efficiency is promoted.

ADVOCATING transfer of idle miners to allotments of tillable land under leases of not less than twenty years at low rentals, testing of soils by agricultural extension departments, tearing down of abandoned houses by idle miners and erection of these houses on tillable ground, discussion of evictions with social workers prior to instituting evictions, the introduction of an assessment of a cent a ton for social work in coal-mining communities, C. E. Pickett, executive secretary, American Friends Service Committee, speaking at the morning session of May 11, presided over by P. C. Thomas, vice-president, Koppers Coal Co., said that he recognized that evictions often were hastened by the destructive behavior of tenants who used the lumber for fencing and fuel.

Mr. Pickett described the institution of small industries for the manufacture of chairs, tables, rag rugs, bed coverlets, scarfs, woolens, garments, brooms, tanned leather, linen and other products of various kinds, showing several of these as samples of the excellent work done by unemployed miners under the aegis of the Quakers' organization.

Large reductions in accidents had been effected by the introduction of a safety organization at the mines of the Pennsylvania Coal & Coke Corporation, declared A. L. Hunt, general superintendent of that company, in an address read by J. T. Gatehouse, safety engineer of that organization. Meetings had been held to discuss safety and to frame rules.

All research work in America, remarked Mr. Thomas, seemed to envision greater economies in the use of fuel. What was wanted was a new use for coal. Unfortunately, said Dr. A. W. Gauger, director of mineral industries research, Pennsylvania State College, the public may ultimately refuse to burn coal and may insist on a more convenient fuel. It was necessary, therefore, to devise easier ways of burning coal. He thought it unwise to follow European leads without discrimination, as we have different coal and a different economic situation.

A free interchange of results in research was necessary. The central Pennsylvania operators were supporting a study of the softening of coal ash at State College. As $60,000,000 was spent annually on the transportation of the non-combustible material in coal, a study should be made contemplating the entire removal of ash.

A Stump air-flow plant (see *Coal Age*, Vol. 37, p. 421; Vol. 38, p. 56) had been erected for Barnes & Tucker Co., which required the services of only two men, said R. T. Todhunter, general manager.

URGING operators to seek all the salient facts about generated power and purchased power as they applied to their specific mines, P. F. Loftus, consulting engineer, Pittsburgh, Pa., the first speaker in the final technical session presided over by E. A. Holbrook, dean, School of Mines, University of Pittsburgh, declared if the operation of "a modern efficient isolated plant will furnish the power requirements of industry at a lower cost than they could be purchased from a utility, then there is justification for the isolated plant and the utilities must face the facts."

Rates should be uniform regardless of volume, and some consideration should be given to pumps and fan service, which might continue after the plant closed down, declared G. F. Osler, president, Chartiers Creek Coal Co. Demand charges should be abolished, said Mr. Dunbar. Coal operators were ready to serve and had established their plants at immense cost, but they did not demand any such compensation of those who bought sparingly or not at all. What was wanted was a flat rate.

Public utilities, said Mr. Hebley, occupied land of high value, had elaborate power-house structures, had transmission line and right-of-way costs, line conversion losses, separate executive organizations, sales and billing departments, heavy fixed charges, had to buy coal and pay freight and required a profit. On the other hand, the land for an operator's plant cost him nothing, as he already had it; the power house could be made moderate and unpretentious; he would have no transmission line or right-of-way cost, no conversion losses, no separate executive organization, no sales and billing department, only a moderate fixed charge, and could use his waste coal at no cost.

Mr. Hebley's company had made some studies into the advantages that would accrue at two specific plants if they generated their own power. In one, a pulverized-fuel furnace would be used consuming the dust from a cleaning plant. Boilers would be operated at 450 lb. pressure; steam at that pressure would be used in a turbine and bled off to a high-pressure Ruth's accumulator at 115 lb. per square inch to provide steam storage for a hoist demand. The exhaust from the steam hoist would pass to a low-pressure accumulator and the steam from this source would be used in a mixed-pressure turbine. A spray pond would cool the condensing water. This 3,500-kw. installation would cost $108 per kilowatt and would amortize its cost by savings in power bills in 56 months.

At a strip pit, a 3,000-kw. unit with a 60-per cent load factor, without a spray pond and using refuse coal, could be erected for $80 per kilowatt and would pay for itself in 45 months. If the coal were figured at 50c. per ton, the amortization period from power savings would be 63 months. After these periods the cost of power would be less than the demand charge.

Mechanization has brought safer coal mining, at least in Wyoming, declared Lyman Fearn, state inspector of coal mines, Rock Springs, Wyo., in a paper read by C. A. McDowell, Pittsburgh Coal Co. In 1932, Wyoming loaded 67 per cent of its output mechanically. Some hazards have been increased, but on the whole the dangers have been decreased.

Comparing mines A and B, Mr. Fearn gave the following facts:

Mine	How Operated	Area of Exposure Sq. ft.	Tonnage 6-yr. Operation	Fatalities	Tons per Fatality
A	Mechanically	972	16,573,594	21	789,219
B	Hand	3,479	18,657,572	63	296,152

It will be noted, said Mr. Fearn, that the men in the hand-operated mine spread over three times as large an area as those in the mechanically operated mine, making it necessary to supervise this much larger area.

Bone coal containing 42 per cent ash can be used to make producer gas, said Mr. Jessup, presenting the paper of F. N. Becker, director of research, Jeddo-Highland Coal Co., Jeddo, Pa. Anthracite does not become porous in combustion, as does bituminous coal, and soon becomes covered with insulating ash. In thin beds, this ash could be mechanically removed, but, in the anthracite producer, a deep fuel bed is needed, 10 ft. or over, or all the coal will not gasify. The producer therefore, is run with moistened air, which breaks down to carbon monoxide and hydrogen. In this way, the heat of gasification is everywhere below a clinkering level. The gas made has 28 to 31 per cent carbon monoxide, 5 to 2½ per cent carbon dioxide, no oxygen, 15 to 12 per cent hydrogen and 0.5 per cent methane. Less than one per cent of the combustible matter fired is lost. The off-take producer gases are at 800 deg. F. About 97 per cent of the heat in the coal is available in the gas and in the water of the producer jacket.

Gas from the producer passes still hot under the boilers and is burned, giving 17.5 to 19.5 per cent carbon dioxide and less than one per cent of oxygen. A test boiler has been run with the gas for 72 hours at 85 per cent efficiency with 200-per cent rating.

The author believes in a judicious mixture of steam and electricity. A plant is being installed for all the electrical power needs of the colliery, except for a small amount taken part of the day from the power company, but enough generated power will not be provided to run the entire plant, because the few completely electrified mines have a power cost three times as high per ton of coal marketed as those operated with a combination of steam and electricity. A 425-lb.-per-square-inch bleeder turbine will be installed, generating over 1,200 kw. The steam will bleed off at 165 lb. per square inch, the correct pressure for the present steam equipment. The new plant will be in operation by December; a 25-per cent return per year over fixed charges is anticipated.

Gas from the producer could be used in a gas engine, but pre-ignition of hydrogen might occasion some trouble. The gas has only 150 B.t.u. per cubic foot, and is better suited for boiler use. If the producer used bituminous coal, the hydrocarbons would condense and make trouble, but with gas from anthracite, condensable fluids would not be present.

Great possibilities in mine-fan economy were presaged by J. E. Jones, safety engineer, Old Ben Coal Corporation, West Frankfort, Ill., who compared the performance of two fans, one a backward-bladed fan with a wide range of accommodation which had replaced the other fan with forward blades, which gave its best results at a definite speed and became far less efficient at faster or slower speeds.

Comparison of Two Fans

Size of fan.....	16x5 ft.	8x4½ ft.
Type.....	Forward curved blades	Backward curved blades
Speed.....	123 r.p.m.	318 r.p.m.
Air delivered...	113,856 cu.ft.	117,600 cu.ft.
Static pressure.	3.56 in..	3.60
Efficiency.....	40.3 per cent	78.1 per cent

As a result of installing this fan at a cost—exclusive of motor and automatic starter—of $5,785.11 and scrapping a fan costing $27,500, a saving of $552 monthly was made. Thus the new fan pays for itself in 10⅓ months. The fan not only gives greater efficiency but does it under a wider range of conditions. Mr. Jones gave the savings that could be made at fifteen different operations throughout the country by the introduction of fans suited to the needs of the mine and of greater inherent efficiency. He stigmatized the mine fan as the most wasteful consumer of power around a coal mine.

INSPECTORS' INSTITUTE

+Studies Economics of Mine Safety

COMPENSATION as a dollars-and-cents incentive to progress and as a means for establishing co-operation between operator, miner and inspector, received consideration at the 24th annual convention of the Mine Inspectors' Institute of America, held in Pittsburgh, Pa., May 15-17. The meeting was better attended than any other the institute has held for several years, members registering from nine states.

Officers elected for the ensuing year are: President, P. J. Friel, Shamokin, Pa.; first vice-president, J. G. Millhouse, Springfield, Ill.; second vice-president, Thomas Stockdale, Freeman, W. Va.; third vice-president, James Berry, Columbus, Ohio; secretary, C. A. McDowell, Pittsburgh, Pa.; assistant secretary, J. J. Forbes, Pittsburgh, Pa.; treasurer, J. J. Rutledge, Baltimore, Md.; editor-in-chief, J. T. Beard, Danbury, Conn. Twenty-one new members were added to the membership. Next year's convention will be held in Louisville, Ky.

In the absence of John F. Daniel, president, the meetings were conducted by Mr. Friel, who, a mine inspector himself, summed up the outsider's attitude toward this group: Miners have thought the inspector is the operator's man; operators have considered him a nuisance; and the public has looked upon him as one who is paid for doing nothing.

In a paper illustrated by slides, Graham Bright, chief electrical engineer, Mine Safety Appliances Co., discussed safety regulation and practice as he had observed both during a five-month trip to coal mines in Australia, South Africa and Continental Europe. J. J. Forbes, supervising engineer, safety division, U. S. Bureau of Mines, discussed in a paper lessons learned from the 28 explosions that occurred in 1932. Of these, 15, or 53.5 per cent, were caused by open lights or smoking, as compared with an average of only 35.2 per cent for the last five-year period. Four of 18 bituminous explosions in his list might have been more disastrous, but, fortunately, were localized by the use of rock dust. In these four, 18 lives were lost, but 501 men escaped. No pellet powder should be used in coal mines; the gobbing of slack coal underground also is extremely hazardous.

J. F. Bryson, safety director, Harlan County Coal Operators' Association, stated that most of the mines in Kentucky, as the result of the dire lesson taught them last year, have abandoned the last-mentioned practice. He added that one operator, who is regarded as a staunch advocate of safety, nevertheless allows his men to shoot down the last 3 ft. of coal in a crosscut without preliminary undermining.

Auxiliary fans generally fail to provide adequate ventilation, said Mr. Forbes in his paper, adding that they may be considered as a confession of inadequate ventilation. R. Dawson Hall, engineering editor, *Coal Age,* contributed the comment that after all is done to ventilate a mine by commonly approved means, certain places might yet remain inadequately ventilated, as in high portions of a mine in thick coal, when an upper lift is taken on the removal of pillars. Line brattice will not suffice for this purpose. Such pockets should be scoured out by currents from an air orifice upwardly directed.

A historical review of explosions, their cause and prevention, was offered in a paper by John E. Jones, safety engineer, Old Ben Coal Corporation, Benton, Ill. He stated that portable electric lamps were procurable in Great Britain as early as 1889, but were rarely used for years thereafter. Not until 1915 were approvals granted in this country to portable electric lamps. Since that time about 285,000 of such lamps have been installed.

C. G. Fromme, state mine inspector, Pottsville, Pa., observed that, though the dust in the anthracite region is regarded as non-explosive, a gas explosion in a dry and dusty section is always more disastrous than one in wet workings. Mr. Jones compared the militaristic regulations of European mines with the loosely regulated American system. Commenting on this point, Mr. Fromme declared that, although most American miners are anxious to maintain safety standards, "too many believe that the coal company or the inspector should provide a heavenly condition of employment in which the miner can proceed with reckless abandon and yet escape injury."

Safety rules and regulations should be written in direct and simple language and limited to essential items, said Ernest L. Bailey, chief, Department of Mines, West Virginia, who read a paper on successful methods of obtaining co-operation. Too many codes read like the Supreme Court brief of a Philadelphia lawyer. The man who writes the rule should appreciate how much time and effort the average mine employee must extend in mastering the contents of a few pages of printed matter.

Excellent results have been obtained by holding monthly group meetings to discuss and analyze accidents, but if these are held at night they should close before nine o'clock, as late hours discourage the attendance of those who retire early. Strict discipline is necessary for the maintenance of cooperation. A conscientious workman may be in sympathy with a program, but if regulations are constantly flouted by fellow workmen he will soon cease his efforts to promote safety.

The Industrial Commission of Ohio, remarked D. M. Ryan, mine safety engineer of that organization, spends 1 per cent of all compensation collections on accident-prevention activities. The most telling way to convince a mine operator of the wisdom of safety precautions is to confront him with his own compensation-cost records and to show him how much he is losing by his neglect of safety. Tab should be kept of the accident record of each section foreman. The Y. & O. Coal Co. not only penalizes a miner for infractions of safety rules but also the men who work with him and allow him to violate orders.

When a man is penalized, he receives an intimate letter from the general superintendent explaining the company's position and his own jeopardy, and inviting him to call and "talk things over." The men seldom appear for this get-together, but the letter, nevertheless, mollifies any grievance they may have when subjected to a five-day layoff. This method avoids labor trouble and changes resentment to boosting.

As a result of the intensive work which many of the larger companies

have been doing, accidents in Ohio mines for 1932 were about 60 per cent less than in 1930, despite a tonnage reduction of only 36 per cent. One company in Ohio has reduced compensation cost per ton from 11.2c. in 1928 to 2.32c. in 1932.

Mr. Bryson questioned whether discussion of compensation costs with operators brings results. Some operators in the Harlan County Coal Operators' Association, which he represents, cooperate with him, but others will listen to no argument. Eight mines under his jurisdiction have had a compensation cost of 27c. per ton, fifteen a cost of 6.1c. and eight a cost of 2c. Many of the miners in eastern Kentucky belong to a sect holding the fatalistic belief that "what is to happen will happen." Some of them even refuse to set a post under loose roof.

Compensation costs tell a convincing story, said Mr. Lightfoot, engineer of accident prevention and compensation, Koppers Coal Co. His company figures the compensation cost per working day each month and the general manager sends a letter to each superintendent discussing this cost, which is prominently displayed on the sticker by which the letter is sealed.

For all practical purposes, declared Frank Hillman, safety inspector, Woodward Iron Co., Woodward, Ala., there are no accidents; that is to say, all injuries are man-made and do not arise from conditions over which men have no control. Whenever a worker violates a safety regulation at Woodward mines, his foreman gives him a slip on which the infractions are entered, sending a copy to the superintendent. The worker must present this slip in person to the superintendent, whose decision is final. Even if the worker is not discharged, he has to explain his case at the coming safety meeting. Any man found working under loose rock is promptly discharged. The most important factor in all safety, warned Mr. Hillman, is making sure the miners understand perfectly what is wanted.

Definite knowledge of methane content in mine atmosphere is needed as a guide in rearranging air splits, declared George S. McCaa, state mine inspector, Pittsburgh, Pa., in a paper in which he laid emphasis on the methane detector. Recent developments which had led to a reduction of methane content were: (1) Slack time, which has allowed officials to study and correct imperfect ventilation; (2) decreased development in solid coal; (3) concentration of working places; (4) airshafts close to face workings; (5) rock shovels to clean up returns; (6) elimination of doors and replacement by overcasts; (7) double in place of single doors; (8) ventilation maps.

Discussing this paper, R. D. Currie, associate mining engineer, U. S. Bureau of Mines, Scranton, Pa., declared that

P. J. Friel
President, Mine Inspectors' Institute of America

the methane percentages obtained with the Union Carbide detector in 231 tests made in 51 anthracite mines differed from those obtained by chemical analyses by an average of less than 0.05; the maximum variation was 0.255. Only four tests showed variations over 0.20 per cent; 178 checked within 0.10 per cent.

Mr. Currie is making similar studies with the new methane detector of the Mine Safety Appliances Co. To date, 137 comparisons have been made. The maximum difference in percentage between determinations made by this detector and chemical analyses has been 0.07 and the average error was 0.017 per cent. More than a third of the readings checked exactly with those made by chemical analysis.

Referring to Mr. McCaa's paper, Mr. Currie wanted to know how the former could detect 0.5 per cent of methane or less using a flame safety lamp. Mr. McCaa explained that he turns down the flame until it has absolutely no yellow peak. A measuring gage attached to the lamp is used to determine the height of the cap. At the top of a slide is a peephole which can be raised as needed to give a three-point line connecting the point of sight with the top of the gas cap and its image on the glass opposite. Making this adjustment, the methane content can be read on the scale direct.

"Many Pennsylvania operators now realize that when they have a safe mine with a low accident record, they have also an efficiently operated mine," said Walter H. Glasgow, Secretary of Mines, Harrisburg, Pa. Operators are furnished reports based on coal production which show their comparative standing in respect to fatal, 60-day and non-serious compensable accidents, and rate each record as good, bad or fair. Comparing the anthracite record during 1932 with that in 1931, 76 lives were saved and 1,923 serious injuries prevented, resulting in a compensation saving estimated at $672,000. Comparing 1932 with the average for the preceding five years in the bituminous region, 55 lives were saved at an estimated economy of $194,425.

To make this innovation in Pennsylvania required much courage, commented Dr. Rutledge; the entire mining industry owes a debt of gratitude to the mine inspection department of that state. A somewhat similar plan has been launched in Kentucky and Illinois. Pennsylvania is doing great work also in its rehabilitation program. Many physicians in mining camps, especially some of the older practitioners, refuse to send injured men to specialists for orthopedic treatment, thereby robbing those injured of rehabilitation opportunity. Disinterest of mine officials in accident prevention arises from lack of knowledge of the cost of accidents in dollars and cents, which the higher management cannot fail to know, because it pays the bills.

Francis Feehan, mine safety commissioner, U. S. Bureau of Mines, rapped the coal-mining industry for its poor showing in safety in comparison with other industrials. Faulty, ineffective methods, and failure to take the workers into its confidence are responsible. Other industries adopt fixed plans and make employment conditional on observation of promulgated rules. He declared he could indicate on four fingers state inspection department heads actively supporting the Joseph A. Holmes Association. If this safety organization is not what is needed, then the industry should shift to something else and get wholeheartedly behind it.

Compensation savings are persuasive, remarked P. J. Moore, state inspector, Carbondale, Pa. Savings made in accident compensation in his state in 1932 helped to convince the legislators that a cut of several hundred thousand dollars in the inspection appropriation was undesirable.

At the Crossroads

● How will the National Industrial Recovery Act affect mining? Bituminous executives will face that question at the National Coal Association convention in Chicago this month. What they say, and other high spots of the convention, will be told in the July *Coal Age*.

● The same issue also will carry the story of the summer meeting of the Illinois Mining Institute, where mechanical cleaning will be the dominant theme.

DRIVE FOR COST REDUCTION

+ Through Mechanization of Mining

Reflected in Equipment at Pittsburgh Exposition

SEVENTY-FIVE manufacturers and distributors of coal-mining equipment and supplies were represented at the Tenth Annual Convention of Practical Coal Operating Men and National Exposition of Coal-Mining Equipment, held at Pittsburgh, Pa., May 8-11, under the auspices of the Manufacturers' Section, Coal Division, American Mining Congress. Reflecting increased pressure for cost reduction in the coal industry, exhibitors stressed the economy and efficiency of their products and equipment for mining, preparation and safety.

THE new Type 6-A track-mounted coal saw for "powderless mining" was the feature of the exhibit of Joy Bros., Inc., Marion, Ohio. This machine, companion equipment to the Type 51-B, floor-mounted coal saw, has a cutting radius of 18 ft. from the center line of the track. Maximum shearing width, according to the makers, is 17 ft., and a straight shearing cut can be made 12 ft. from the center of the track. Length of the saw blade, which makes a 1½-in. kerf, is 6 ft. Standard cutting height is 6 ft., but with modifications this can be increased to 8 ft.

Power for cutting and tramming is supplied by a 30-hp. Westinghouse "Thermoguard" motor with thermostatic protection against overheating of the windings. Flameproof electrical equipment is standard. Dimensions of the saw are: length, blade in cutting position, 24 ft.; length, blade in tramming position, 18 ft.; width, 5 ft.; height, 27 in. Weight is 6 tons, and tramming speed is 270 ft. per minute in high gear and 29 ft. per minute in low gear. Sumping speed is the same as the low-gear tramming speed; swinging feed speed varies from 0 to 80 ft. per minute, while vertical feed speed is 0 to 100 ft. per minute. Saw chain speed is 600 ft. per minute.

While there were no machines actually exhibited, coal cutters were stressed pictorially by Jeffrey Mfg. Co., Columbus, Ohio; Goodman Mfg. Co., Chicago; and Sullivan Machinery Co., Chicago. Jeffrey and Goodman also depicted photographically their coal-loading and conveying equipment for underground use, and had on hand items from their lines of repair parts. Standard and replacement parts for mining machines formed a part of the exhibit of the Penn Machine Co., Johnstown, Pa.

The Sullivan company, in addition to its cutters and loading machines and parts, displayed the new patented "Twin-Pick" cutter bits and holders, shown in the accompanying illustration. Holders are made of drop-forged, heat-treated steel, and fit any chain block, according to the company, while the bits are made of a special wear-resisting, heat-treated alloy steel. When one cutting point is dulled, the bit is reversed in the holder and the fresh cutting edge presented to the coal. Blacksmithing or resharpening is not required; setting time and power consumption are reduced, and the bit gages itself accurately and automatically.

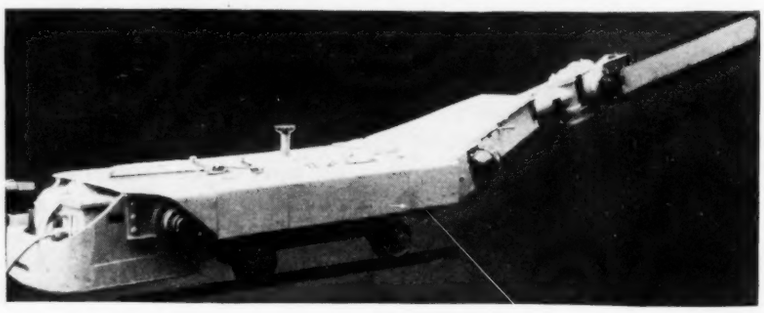
Cincinnati cutter chains and mining machine repair parts formed part of the exhibit of the Bertrand P. Tracy Co., Pittsburgh, Pa. Pennsylvania & West Virginia Supply Co., Wheeling, W. Va., called attention to its new Warwood mining machine bits, made from controlled-analysis carbon steel by a process said to give bits identical in size and shape with points free from forging defects. The bits are said to have approved angle and clearance, and will follow through the bit sharpener without special shaping, thus, it is declared, saving wear and tear on the sharpener. Warwood bits also are furnished with points tempered ready for use without extra cost.

Robins Conveying Belt Co., New York, displayed a section of its underground belt conveyor, one of the items in its new line of conveying equipment. Meco, Inc., Baltimore, Md., exhibited sections of its demountable troughed belt conveyor. Fairmont Mining Machinery Co., Fairmont, W. Va., used photographs to present its line of underground conveyors and elevators.

Seven companies had exhibits dealing in whole or in part with drills and accessories. Chicago Pneumatic Tool Co., New York, showed items from its lines of electric and pneumatic drills, nut reamers, grinders and hammers for repair work, and also a new post—Type 1000—for 472, 473 and 574 "Little Giant" mounted electric drills, which is equipped with a ratchet crank and rack bolted to the side of the tubing for raising the turntable and drill, displacing the notches on the side of the tubing previously used.

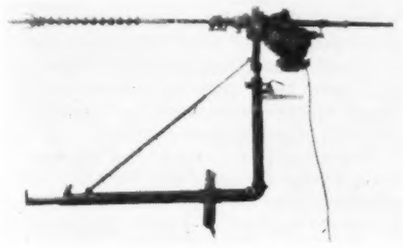
Colonial Supply Co., Pittsburgh, Pa., showed two models of its one-man permissible coal drill. Jeffrey Mfg. Co. presented its various types of electric coal drills through photographs, as did the Sullivan Machinery Co. Sprague & Henwood, Inc., Scranton, Pa., had on display diamond drills, ranging in size from the new "Little Giant" core drill weighing

Joy 6-A Coal Saw in Position for Shearing. Saw Blade Is Folded Back Over Top of Machine in Moving.



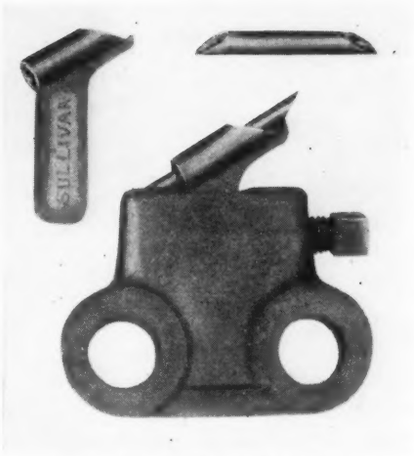
86 lb. and having a capacity of 100 ft. to the B-2 diamond drill with a capacity of 3,200 ft. The company also showed diamond bits, core barrels, sample testers and specimen cores. Timken Roller Bearing Co., Canton, Ohio, called attention to the Timken detachable rock bit for pneumatic drills, described in the April, 1933, *Coal Age*, p. 139.

Meyer Hydraulic Coal Breaker, Denver, Colo., exhibited the hydraulic coal breaker and also a drill bit and drill column developed primarily for use with this equipment but also adaptable to general use. The coal breaker (*Coal Age*, August, 1932, p. 315) employs a rubber expansion cartridge filled with



Meyer Drill Column and Bit.

water by a hand pump to bring down the coal. The drill bit was developed primarily for drilling straight, round holes in which the cartridges are inserted, and is made with a pilot bit which leads the cutters by 5 in. Cutters may be set to bore the desired size of hole without taking them out of the mine, it is declared, and the cutter bits and pilot are faced with hard-surfacing



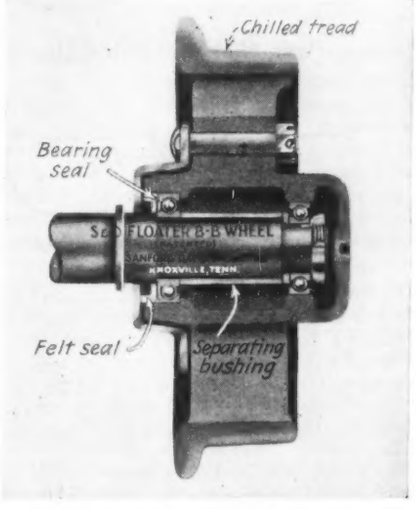
Showing Application of Sullivan "Turn-Pick" Bits.

material for long life. Extensions may be inserted in the drill twist, it is said, without removing the bit from the hole. Standard bit sizes range from 3¾ to 5½ in.; larger or smaller sizes are available.

The new Meyer drill column features a three-point suspension on the bottom only, and, according to the company, can be built for any type of rotary coal drill. The column is equipped with an extension for use under overhangs and a ratchet for adjusting the position of the drill for various heights of holes. Use of tubing and the incorporation of telescopic members allows the column to be collapsed when not in use or in moving into close places. Weight is approximately 50 lb. complete.

primarily for lowering or hauling railroad cars past loading points, particularly where "sandwich loading" is practiced, was exhibited by the Brown-Fayro Co., Johnstown, Pa. Rope pull capacity is 6,000 lb., and retarding capacity is 8,000 to 12,000 lb. An automatic brake is mounted on the motor shaft to permit rotation of the motor in the winding direction and to prevent rotation in the opposite direction, except when released by a hand rope attached to the control lever. Over-all width is 30 in.

Brown-Fayro also showed a new 14-in. double-webbed Timken-bearing car wheel with the following features: better distribution of metal for greater strength per unit of weight; greater uniformity of chill; and increased flange strength. The wheel also can be constructed to prevent spragging, if desired. Another wheel, equipped with Timken bearings and patented hub cap fastenings which do not project beyond the hub surface, was offered primarily for use where cars are caged by the hubs.



Sanford-Day Ball-Bearing Mine-Car Wheel.

Efficient Transportation Equipment

MINE CARS were the principal features of the transportation exhibits at Pittsburgh. General Steel Castings Corporation, Eddystone, Pa., showed a new Commonwealth cast-steel underframe for use at a Stonega Coke & Coal Co. mine. The Stonega car has a length of 10 ft. inside, an inside width of 6 ft. 6⅜ in., and a height of 48 in. Capacity, level full, is 213 cu.ft.; weight is 4,900 lb., or 23 lb. per cubic foot of capacity.

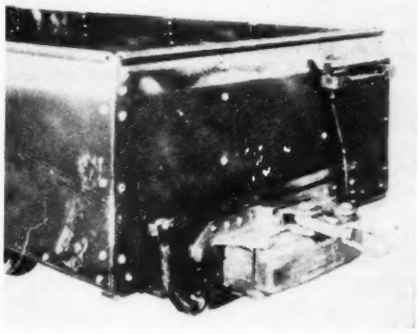
Watt Car & Wheel Co., Barnesville, Ohio, exhibited a new 173-cu.ft. mine car designed for the Kellys Creek Colliery Co. Body dimensions are 72x124 in.; height, 42 in.; weight, 4,420 lb. The car is built of "Cop-R-Loy" plate and is equipped with Miner draft and buffer gear.

Sanford-Day Iron Works, Inc., Knoxville, Tenn., displayed models of its bottom-dumping mine and stripping cars, and demonstrated a new spring buffer which is built into the end sill structure of the car. In addition to reducing the haulage strains, the buffer has the further advantage, according to the company, that it does not project back into the lading space of the car.

Sanford-Day also stressed its new ball-bearing wheel, designated as the "S. & D. Floater B-B" wheel. This wheel, according to the company, need not be adjusted by the user, as it is necessary only to pull the nuts up tight when installing it. The hub race of the outer bearing is a floater, and all end-thrust is taken on the large inner bearing. The solid front hub prevents grease leakage at that point, while the rear hub is protected by a double seal and a compressed all-wool felt collar. When the wheel casting is removed, all bearings stay in place on the axle journals, and their adjustment is not disturbed. Removal of the entire truck from the car can be accomplished with a wrench.

A new 5-hp. combination electric hoist and car retarder, designed

New Watt Copper-Bearing Steel Car With Miner Draft and Buffing Gear.



The company also exhibited a new combination switch brace and rerailer for preventing damage from hauling derailed cars through switches, as well as its regular line of derailers, Timken-equipped track rollers with supporting brackets, sheaves, room pulleys and similar equipment.

Mine car wheels, links, pins and hitchings were shown by the Penn Machine Co., Johnstown, Pa.; Phillips Mine & Mill Supply Co., Pittsburgh, Pa.; Bertrand P. Tracy Co., Pittsburgh, Pa.; and the Bonney-Floyd Co., Columbus, Ohio. Bonney-Floyd also displayed a new swivel hitching and a new hinged link. The swivel hitching is made without a rivet or bolt, except for one of the former to hold the eye member retainer in place. New eye members may easily be installed, the company says, by driving out the rivet and removing the retainer. The new hinged link consists of a yoke with bosses which fit in a hole in the eye member. The bosses take the stress which otherwise would fall on the rivet or bolt.

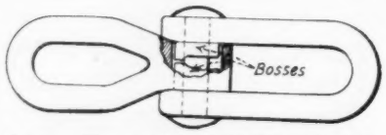
Haulage locomotives were shown pic-

torially by Goodman Mfg. Co., Chicago, and Jeffrey Mfg. Co., Columbus, Ohio. Phillips Mine & Mill Supply Co. also employed photographs to show its line of mine cars, dumps and other haulage equipment. Locomotive parts were included in the displays of Jeffrey Mfg. Co., the Penn Machine Co. and Flood City Brass & Electric Co., Johnstown, Pa.

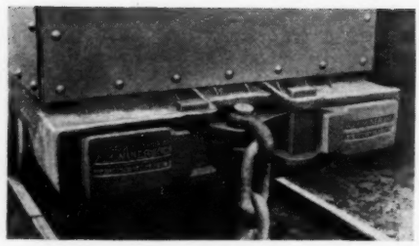
West Virginia Rail Co., Huntington, W. Va., showed a complete line of rail sections, as well as steel ties, switch stands, throws and other track accessories.

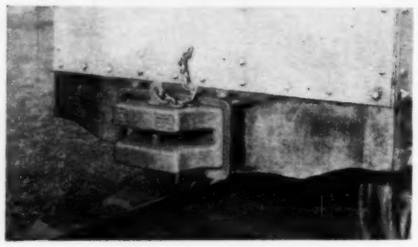
W. H. Miner, Inc., Chicago, had on hand three different types of draft and buffing gear for all types of all-steel and steel underframe cars. These gears are offered to protect cars against shock, thereby reducing maintenance, and are attached to the outside end of the car, thus increasing cubical capacity. Interchangeability with rigid-type bumpers, great strength, flexibility and automatic adjustment to the demands of draft and buff are stressed by the company. In draft, part of the springs are used to smooth out starting, but in buff all the springs come into action to afford maximum protection against shocks. The springs are positively protected against being driven solid, according to the company, and thus are safeguarded against breakage and permanent set.

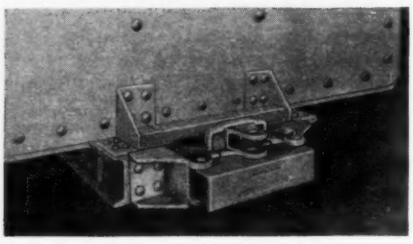
Bonney-Floyd Alloy-Steel Swivel Hitching.



Bonney-Floyd Alloy-Steel Hinged Link.







Three Types of Miner Draft and Buffing Gear. Top, Class "D"; Center, Class "S"; Bottom, Class "SL."

Power-Saving Electrical Aids

SAFETY and economy were again stressed by exhibitors of electrical equipment. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., showed by means of a model the use of the photo-electric control for mine doors (*Coal Age*, March, 1933, p. 77); a new surge-proof transformer; a 5-hp. De-ion circuit breaker on repeated overload tests; "Thermoguard" motor protection; a disassembled squirrel-cage motor with prewound core; gear-motors; controller; and renewal parts.

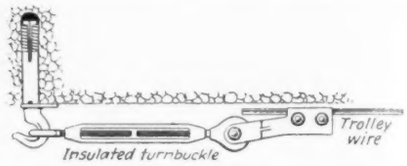
In the surge-proof transformer, De-ion protection gaps are connected to the windings so as to limit the voltage stress between high- and low-voltage windings and between windings and the core and case, thus protecting the insulation. Other features include: self-protection against surge voltages; elimination of fuse outages and lightning arresters; and immediate restoration of line voltage.

De-ion circuit breakers, the company states, eliminate the use of fuses and thereby save the time lost in their replacement and the restoration of service. Repeated short-circuits are withstood without damage. The trip mechanism is actuated by a bimetallic element calibrated and sealed so that the setting cannot be changed. "Thermoguard" motor protection is achieved by the installation of a temperature relay on the motor windings, which automatically shuts down the motor when windings heat up past the danger point.

Power-factor control apparatus, gear motors, automatic switchgear and coils were exhibited by General Electric Co., Schenectady, N. Y.

In addition to items from its line of overhead line material, insulators, and rail bonds, Ohio Brass Co., Mansfield, Ohio, displayed a new removable expansion bolt for mine hangers, a new rail clamp for return cables, a new trolley glider with longer contact surface and a larger shunt, locomotive headlights and resistances, safety switches, circuit breakers, fused trolley taps, new steel- and copper-weld bonds for application under the base of the rail, and hand and automatic motor starters, including three new models. The new steel- and copper-weld bonds feature easy removability for reuse.

The new double-contactor, completely automatic starter with instantaneous and overload protection, one-point resistance and fixed time starting shown by Ohio Brass features instantaneous protection, utilizing the magnetic circuit. A part of the circuit is hinged, and the operating current through the blowout coil is used to operate this hinged armature for overloads beyond the setting of the equipment. Overloads under this point are taken care of by an inverse-time thermal switch.



Dead-End Clamp Developed by the Electric Railway Equipment Co.

By replacing the circuit breaker in the company's previous circuit-breaker starter with a safety switch, Ohio Brass offers the new automatic starter, which makes a switch ahead of the starter unnecessary. The safety switch used in this starter is a quick-make, quick-break type with magnetic blowout, and is interlocked with the starter case.

Ohio Brass also displayed a new conveyor starter consisting of a case interlocked with operating handle, a nichrome resistance and a two-point knife switch. To operate, the handle with the knife switch is moved to the first position against a latch. The resistance is then in series with the armature. It is then necessary for the operator to release the latch and move the handle to across-the-line position.

Post-Glover Electric Co., Cincinnati, Ohio, in addition to P-G steel resistances and starters, showed the new P-G transfer switches for single- and double-trolley-and-reel, 250- and 500-volt gathering locomotives up to eight tons. Increased wiping surface has been obtained by providing each conductor with a double-contact assembly. Large coils of heavier wire are said to insure positive, automatic action even where low voltage prevails, and shocks and burns are prevented.

Electric Railway Equipment Co., Cincinnati, displayed a complete line of overhead trolley equipment featuring a molded insulation with high strength malleable iron and bronze trolley fit-

The display of the National Carbon Co., showing the scope of the operations of the Union Carbide & Carbon Corporation, took first place in a poll to determine the most interesting exhibit at the Pittsburgh exposition. The vote for second place resulted in a tie between Mine Safety Appliances Co. and Joy Bros., Inc. Post-Glover Electric Co. and the General Electric Co. shared third honors.

tings, and trolley and feeder supports. The company's exhibit included a new manually operated section insulator with renewable switch contact points bolted onto a milled surface, thus facilitating replacement of contacts without removing the insulator from the line. Another new item was a dead-end clamp for trolley wires; the maker declares that cut-and-try methods of securing the proper length of wire are eliminated, and that it is necessary to make only one setting of the comealongs.

In addition to line material, trolley and pole equipment, section insulators, locomotive transfer switches and controllers, Flood City Brass & Electric Co., Johnstown, Pa., showed a new field-coil testing machine and a new trolley splicer. The former consists of a U-shaped electro-magnet excited by coils on the left-hand pole. The machine is connected to the a.c. supply (110, 220 or 440 volts), the magnet switch is closed and the reading on an ammeter is noted. The coil is then placed on the right-hand pole of the magnet and the process repeated. If the ammeter reading is unchanged, the coil is in good condition.

Flood City "Bypass" Trolley-Wire Splicer

Flood City "Bypass" trolley wire splicer, 12 in. long, is made of "gunmetal" bronze with smooth V-cut ends to reduce arcing. The wire enters in a straight line, and is then bypassed and bent up, if desired, after the setscrews are tightened. The splicer can be suspended from the roof by an ordinary mine hanger and clamp.

A heavy-wire welding rheostat, AX cross bonds, A2H steel terminal bonds, CAEH copper-weld bonds, AUF steel-terminal and CUF copper-terminal bonds for application under the base of the rail, and A2B temporary removable bonds were shown by the Electric Railway Improvement Co., Cleveland, Ohio. Penn Machine Co., Johnstown, Pa., displayed items from its line of "Everlast" bonds.

American Steel & Wire Co., Chicago, included in its display a complete line of rail bonds and accessories, electrical wire and cables, including mining-machine, shovel and borehole cables, cords and trouble-light assemblies. John A. Roebling's Sons Co., Trenton, N. J., showed samples of its complete line of armature and field coils, solenoid coils and single-, double- and three-conductor mining cables.

Pennsylvania Electric Repair Co. and Close Distributing Co., Pittsburgh, Pa., displayed items from their line of armature coils and field coils, and stressed their insulation practice. Electric Mfg. & Repair Co., Pittsburgh, presented its electrical repair service and exhibited armature and field coils, as did the Pennsylvania & West Virginia Supply Co., Wheeling, W. Va. Edison Storage Battery Division of Thomas A. Edison, Inc., East Orange, N. J., displayed its full line of nickel-iron-alkali storage battery cells.

The new Grade AYK slip-ring brush with L-type connections was shown by the National Carbon Co., Inc., Cleveland, Ohio. Grade AYK is a copper-impregnated graphitic brush, which is recommended by the company for slip-ring applications of moderate current density. Dusting is eliminated, according to the company, and a dark, well-polished ring surface is maintained.

Equipment for Low-Cost Drainage

IN CONJUNCTION with the American Sheet & Tin Plate Co., the National Tube Co., Pittsburgh, Pa., displayed the new "Duroline" cement-lined pipe, designed primarily for carrying liquids which rust, corrode or otherwise attack unprotected metal pipe, and National copper-bearing steel pipe. "Duroline" cement, it is declared, has only one-third the solubility of ordinary portland cement mixtures, and special manufacturing and curing methods are employed to secure a complete bond between lining and metal and to reduce shrinkage in curing to a minimum, thus preventing separation of the lining due to extreme temperature changes and breakage during ordinary handling or application. Since a smooth inner surface is retained over long periods of time, no increase in size is necessary as compared with black or galvanized pipe. "Durolined" couplings and fittings and a special joint compound are available for threaded joints; pipe ends can be prepared for patented fittings, bell-and-spigot or flanged joints. Sizes range from ½ to 12 in.

"Bermico" fiber mine pipe and special acid-resisting threaded couplings were shown by the Brown Co., Portland, Me., in conjunction with the Colonial Supply Co., Pittsburgh, Pa. "Universal" cast-iron pipe and fittings were shown at the booth of the Post-Glover Electric Co., Cincinnati, Ohio.

Warren Steam Pump Co., Warren, Mass., exhibited a 6-in. all-bronze chrome-fitted centrifugal pump from its line of single- and multiple-stage pumps. The company stresses accurate workmanship, accessibility of parts and ease of replacement, and features accurately fitted snap-fit case rings, properly proportioned volute passages and impeller vanes, ample clearances between case rings and impellers, ample distances between bearing centers and large bearings. Goulds pumps and Walworth valves were shown by the Frick-Reid Supply Corporation, Pittsburgh, Pa. Wm. Powell Co. alloy valves for use with acid and mine waters were displayed by the Colonial Supply Co. Penn Machine Co. and Flood City Brass & Electric Co., Johnstown, Pa., displayed bronze pump impellers.

A new inclosed self-oiling piston-type mine gathering pump with an Austin water end designed to accommodate either a 4- or 5-in. diameter piston was exhibited by the Brown-Fayro Co., Johnstown, Pa. The power frame, consisting of a completely inclosed ball-bearing unit, will take motors from 2 to 5 hp. Brown-Fayro also showed a control device for centrifugal pumps designed for greater sensitiveness on low heads. This unit, of anti-acid bronze construction, comprises a differential plunger working in a cylinder, and is so arranged that differences in pressure will actuate the plunger and shut down the pump when the flow of water stops. The company also showed Austin-Brownie pump parts, foot valves, strainers and other accessories.

The Deming Co. (Salem, Ohio) exhibit included deep-well turbine pumps; Cleco-Deming air-operated centrifugal sump pumps for shaft sinking work and draining small pools; side-suction and double-suction centrifugal pumps; the "Primo-Vac-Trap," an automatic priming device, vacuum chamber and dirt trap for mine pumps; piston-type mine gathering pumps; and domestic water systems.

Modern Coal-Preparation Systems

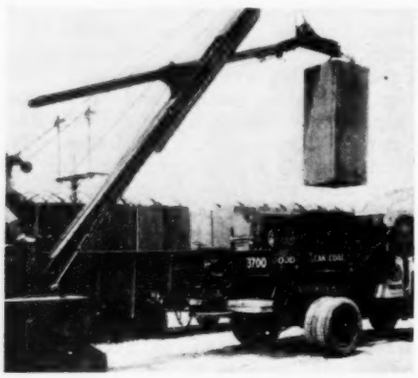
EIGHTEEN manufacturers of preparation equipment and processes exhibited at the Pittsburgh exposition, employing models, full-sized equipment and pictorial displays to tell their stories. Roberts & Schaefer Co., Chicago, showed a full-size Stump "Air-Flow" coal cleaner *(Coal Age,* November, 1932, p. 421), a "RandS Ro-Sieve" for fine-coal screening, fuel produced by the "Kleen-Blox" process and diagrams of the Wuensch coal-cleaning process. Koppers-Rheolaveur Co., Pittsburgh, Pa., showed the installation and operation of the Rheolaveur washer, Carpenter centrifugal dryer, the Birtley deduster and the Waring dust collector by photographs, diagrams and flowsheets.

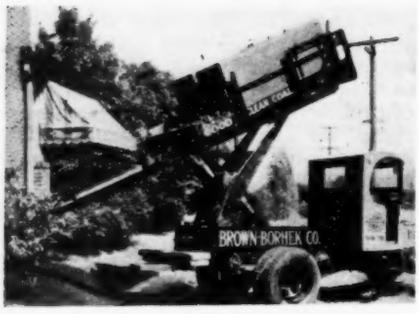
Link-Belt Co., Chicago, had on hand a working model of the Link-Belt-Simon-Carves washer, together with photographs of the Simon-Carves dust-extraction system *(Coal Age,* March, 1933, p. 107). Fairmont Mining Machinery Co., Fairmont, W. Va., displayed drawings and photographs of Peale-Davis pneumo-gravity separators. W. S. Tyler Co., Cleveland, Ohio, exhibited a new Type 400 vibrator *(Coal Age,* March, 1933, p. 107). Niagara Roller Bearing Screen Co., Buffalo, N. Y., used a model to show the characteristics of its vibrating screens.

Hydrotator Co., Cleveland, Ohio, exhibited a working model of the three-stage air-sand process for cleaning coal.

Oliver United Filters, Inc., New York, had on hand a model of the D-L-O continuous heat dryer (*Coal Age,* November, 1932, p. 421; January, 1933, p. 7). Robins Conveying Belt Co., New York, presented a pictorial display of its screening, crushing and loading equipment.

The new "Turbo-Clone" dynamic dust precipitator (*Coal Age,* April, 1933, p. 139) and the "Air-Mat" dust arrester were displayed by the American Air Filter Co., Inc., Louisville, Ky. Blaw-Knox Co., Pittsburgh, Pa., featured a photographic display of the Blaw-Knox "Deduster" and samples of both raw and dedusted coals.





Top, Unloading Jeddo-Highland Container. Bottom, Delivering Container Coal to the Consumer.

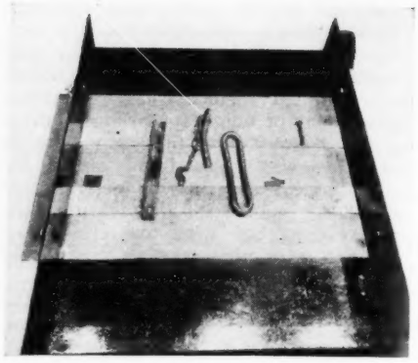
American Sheet & Tin Plate Co., Pittsburgh, Pa., exhibited shaker-screen plates made of the new "USS 12" stainless steel (12 to 14 per cent chromium). Chief features claimed are high resistance to corrosion, oxidation and abrasion. Perforations do not enlarge to any marked degree in use, the company declares, thus reducing sizing loss. Greater screening efficiency is secured, as chromium-steel plates may be two or three gages lighter than other materials for the same use.

Hendrick Mfg. Co., Carbondale, Pa., displayed flanged lip screens, corrugated plates for vibrating screens, "Mitco" interlocked gratings, bronze and steel dewatering screen plates and hand and power testing outfits. John A. Roebling's Sons Co., Trenton, N. J., showed samples of its woven-wire fabrics for screening.

Sun Oil Co., Philadelphia, Pa., carried out at its booth demonstrations of the dustproofing qualities of "Coalkote A" for use in dealers' yards and "Coalkote B" for use at mines and plants, and showed a model of a treating plant. Coal Treating Equipment Co., Cleveland, Ohio, offered "Mau-Rex" for dustproofing coal, and stressed its new product, "Catalite," for treating coal for the prevention of hard clinker formation and carbon deposits. "Catalite," according to the company, is non-corrosive and non-poisonous, and is not an oxidizing agent. Deming Co., Salem, Ohio, displayed a 12-g.p.m. coal-treating outfit.

The "Penn-Wa" magnetic separator for installation in chutes was displayed by the Pennsylvania & West Virginia Supply Co., Wheeling, W. Va. This separator, it is declared, is easy to install, as no special equipment is needed, at a cost of one-fifth to one-tenth of other types of separators. Widths vary from 12 to 54 in.

Jeddo-Highland Coal Co., Jeddo, Pa., had on display the "Heaterange" for cooking and heating (*Coal Age,* November, 1932, p. 418) and a new steel container for shipping one-ton lots of coal. Use of this container, according to the company, prevents substitution, degradation and theft, and permits the shipment of more than one size of coal in a car lot. The containers are carried in gondolas and are unloaded into trucks with special bodies by a caterpillar crane. The container is sealed at the mine, and this seal is not broken until the coal is delivered.

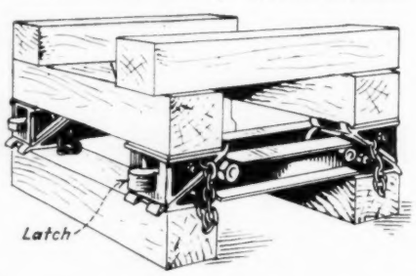


"Penn-Wa" Magnetic Separator

Industry Offers Coal-Mining Aids

SUPPLEMENTING other general classes of equipment, several manufacturers featured wire rope, lubricants, mechanical power transmission equipment, wood preservatives and other coal-mining aids at the Pittsburgh exposition. American Steel & Wire Co., Chicago, displayed mine ropes, tramway ropes and accessories, including "Fiege Tiger-Claw" fittings. John A. Roebling's Sons Co., Trenton, N. J., and A. Leschen & Sons Rope Co., St. Louis, Mo., showed examples of their lines of wire rope and fittings.

Roller bearings for cars, locomotives, pumps, conveyors and other mining equipment were featured by the Timken Roller Bearing Co., Canton, Ohio, which called attention to a mine-car axle cut away to show mounting and operation of the bearing. Frick-Reid Supply Corporation, Pittsburgh, Pa., showed Rex chain, Norma-Hoffman bearings and Goodyear belting, hose and sheet packing. SKF bearings, Chisholm-Moore steel and aluminum-alloy industrial hoists and "Ace-O-Pax," a semi-metallic packing not affected by acid mine water, were displayed by the Colonial Supply Co., Pittsburgh, Pa. Tyson Roller Bearing Corporation, Massillon, Ohio, offered its cageless, tapered roller bearings for mining equipment.



Meco Chock Release

In addition to a full line of oils and greases, the Sun Oil Co., Philadelphia, Pa., emphasized "Sunoco" non-corrosive emulsified chain oil for the lubrication of mining-machine cutter chains and tipple chains with guards. When mixed with 10 parts of water, according to the company, the new oil reduces these lubrication costs 60 to 80 per cent. Sun Oil Co. also offered extreme-pressure lubricants Nos. 90 and 160 for "Hypoid" (full-contact, close-clearance) gears for use in speed reducers and similar equipment. These lubricants, it is said, have a film strength six times that of cylinder stock, and lubricate both gears and bearings.

Hulburt Oil & Grease Co., Philadelphia, Pa., offered samples of mining greases, and the Gulf Refining Co., Pittsburgh, Pa., showed oils and greases for industrial and mining applications. Standard Oil Co. of Indiana, Chicago, displayed lubricants and called attention to its technical papers on lubrication problems. "Gredag" greases were displayed by the National Carbon Co., Cleveland, Ohio. "Tulc" oils and greases were shown by the Universal Lubricating Co., Cleveland, Ohio.

Brown-Fayro Co., Johnstown, Pa., called attention to its new heavy-duty hand-type grease gun which can be used with suitable connectors for all types of grease plugs. Concordia Electric Co., Pittsburgh, Pa., showed Lincoln portable greasing equipment and a new Lincoln air-operated drum pump for applying grease directly to mine-car bearings from the original container.

Meco, Inc., Baltimore, Md., demonstrated the operation of its new chock release for removing timber cribs. To release the moving part which causes the crib to collapse, it is only necessary to knock up the latch. Positive action and adaptability to distant tripping are stressed by the company, which also points to light weight and quick collapsing action under the heaviest of loads. Releases for use with individual

posts also are available from the company.

Jeddo-Highland Coal Co., Jeddo, Pa., displayed the Yarnall-Waring automatic control valve for reducing compressed air losses (*Coal Age*, November, 1932, p. 399). Gears and pinions were shown by the Bertrand P. Tracy Co., Pittsburgh, Pa., and the Penn Machine Co., Johnstown, Pa.

Treated timbers and treating chemicals were shown by the Wood Preserving Corporation, Pittsburgh, Pa., and the American Wood Preservers Association, Chicago.

New Products for Safety

SAFETY equipment, explosives and ventilating equipment again claimed a large share of attention at the exposition. Additions to the products of Mine Safety Appliances Co., Pittsburgh, Pa., shown included a new "Skullgard," a hand guard for use in cutting cap pieces, new protective goggles, an improved carbon monoxide indicator and a new methane detector and indicator. The new "Skullgard," Type D, is constructed with a rubber-cushion lining and a flexible-base crown to fit better to the wearer's head. Type D is lighter than previous models and has the same ventilation features.

The new M-S-A hand guard is made of galvanized sheet steel and can be used on either the right or left hand when cutting cap pieces. The new M-S-A protective goggles are made with 50-mm. lenses for greater protection and are fitted with an adjustable nose bridge.

With the new M-S-A approved methane detector, according to the company, it is possible to measure methane concentrations with an accuracy of 0.05 per cent and to estimate concentrations within 0.01 per cent with a fair degree of accuracy. The detector is a single unit, operated from a cap-lamp battery, and features provisions for checking zero setting without returning to fresh air, and positive control of sample, due to the fact that operation does not depend on diffusion. Consequently, it is said, the detector can be used in any air current, regardless of velocity. Weight, including battery, is approximately 9½ lb.

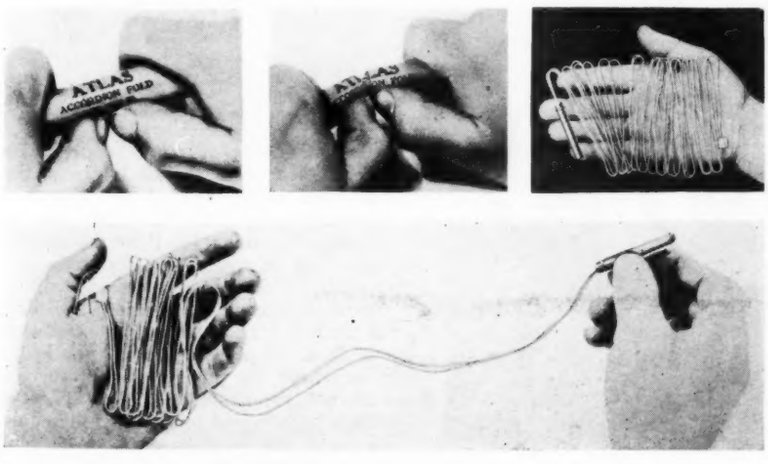
The improved M-S-A carbon-monoxide detector has more accessible valves and provisions for quicker and more accurate comparisons. Extra detector tubes are mounted in a flat case which fits the pocket for protection and ease of transportation.

The U.C.C. methane indicator-detector, distributed by the Union Carbide Sales Co., New York City, formed a part of the National Carbon Co. exhibit.

Concordia Electric Co., Pittsburgh, Pa., offered for inspection the new "CEAG" Type AL portable four-cell trouble lamp, equipped with a shoulder strap for transportation. Weight is 16 lb., and the lamp, with adjustable-focus reflector, has a candlepower of 6,000. Concordia also displayed the new "CEAG" Type OKW-3 flame-electric lamp, which includes an electric light for traveling and a flame lamp for gas testing. By use of a spring contact, current is obtained from the battery for heating a platinum filament, which in turn ignites the wick of the flame lamp for gas testing. The company also offered the new "CEAG" Type G pneumatic-vapor lamp. This lamp is equipped with an electric bulb for traveling. At the working face, the lamp is connected to the compressed-air line, whereupon the electric light automatically is extinguished and a 25-cp. gas mantle is lighted.

Safety First Supply Co., Pittsburgh, Pa., displayed "Chippewa" safety shoes, Bullard safety headgear and gas masks, Willson Products Co. goggles and respiratory equipment, the Clark inhalator, welding masks, first-aid equipment and illuminated bulletin boards. H. Childs & Co., Pittsburgh, Pa., displayed "Iron Age" steel-toed safety shoes and miners' rubber footwear. A complete line of leather and rubber safety shoes, boots and pacs for use in both wet and dry mines was displayed by the Lehigh Safety Shoe Co., Allentown, Pa. The Lehigh company stressed in particular a new rubber-soled safety shoe for dry mines with patented leather insole, retailing at $1.60.

Construction and Use of Atlas "Accordion-Fold" Electric Blasting Caps.



Portable Lamp & Equipment Co., Pittsburgh, Pa., exhibited the new 78-oz. Wheat electric cap lamp with both double-filament and emergency bulbs. Each filament of the main bulb, according to the company, has a life of 125 hours and a light intensity of 9 mean candlepower and 45 beam candlepower. Other features set forth by the company include: automatic switch, light type headpiece, threaded bezel ring, charging contacts in the headpiece to permit charging without taking the lamp apart, and maximum lumens per unit of weight. In connection with the new lamp, the company stressed the "cafeteria" service system made possible by the use of the constant potential charging method. This system enables each man to take out and replace his own lamp. The company also showed an automatic charging rack, a charging generator and the "Cool-Cap" (*Coal Age*, February, 1933, p. 73).

Explosives and blasting accessories were shown by five companies. Western Cartridge Co., East Alton, Ill., exhibited Liberty explosives and Western fuse caps, electric blasting caps and "Protecto-O-Spool" electric blasting caps (*Coal Age*, June, 1932, p. 246). Hercules Powder Co. and E. I. duPont de Nemours & Co., Wilmington, Del., were represented with their lines of explosives and blasting accessories.

Atlas Powder Co., Wilmington, Del., stressed its "Blakstix" blasting agent for use in coal mines (*Coal Age*, February, 1932, p. 73) and called attention to the new "Accordion-Fold" electric blasting caps in which the cap is inclosed in a package with the wires wound around it for protection on all sides and ends. According to the company, the package is handy to carry, easily opened, keeps the wires folded accordion-wise so that they open naturally into position, and facilitates priming with a part of the wires without unfolding the remainder.

In addition to fulminate of mercury blasting caps, Cordeau-Bickford detonating fuse and fittings, explosives of various types and blasting supplies, the General Explosives Corporation, Latrobe, Pa., displayed its new "Genite E" permissible explosive. This explosive is offered by the company as a substitute for other low-strength explosives for use in soft coal, and has a speed of detonation of 5,900 ft. per second. Cartridge count is 466 sticks per 100 lb.

Various types of Cardox shells and blasting methods were shown at the booth of the Safety Mining Co., Chicago.

Robinson Ventilating Co., Zelienople, Pa., presented a pictorial display of its mine fan installations, as did the Jeffrey Mfg. Co., Columbus, Ohio. Meco, Inc., exhibited a constant-type, air-driven fan for use with ventilating tubes. Features outlined by the company include constant air consumption and delivery over long periods of time. Four sizes are available for 12-, 16-, 20- and 24-in. tubing.

Treesdale Laboratories, Inc., Pittsburgh, Pa., demonstrated the fire-resisting qualities of brattice cloth flameproofed by the company's new process. American Brattice Co. ventilating tubing was displayed by the Pennsylvania & West Virginia Supply Co., Wheeling, W. Va.

OPERATING IDEAS

From Production, Electrical and Mechanical Men

Spare Oxygen Cylinder Aids In Apparatus Failure

In the use of self-contained breathing apparatus, especially in exploration work after mine explosions, men at times travel in very close places where the joints of the apparatus are likely to be jarred loose by contact with the rib or timbers, declares John Lyons, safety engineer, Bell & Zoller Coal & Mining Co., Zeigler, Ill. The resulting loss of oxygen may not be discovered until the supply is too low to complete the return trip. On the other hand, oxygen may be lost through defective parts or as a result of failure to tighten properly and test joints before leaving the fresh-air base.

"While admitting that we should first endeavor by all known means to avoid the loss of oxygen through the above-mentioned causes," says Mr. Lyons, "our rescue teams trained at the Zeigler mine-rescue station of the Bell & Zoller Coal & Mining Co. also carry an extra supply of oxygen on all trips of any distance from fresh air, and in practice work the members learn to make changes from the regular oxygen supply to the spare in irrespirable air.

"We use for this purpose a 6-cu.ft. cylinder which formerly was part of a Draeger oxygen-inhalation apparatus. By employing an adapter, we connect to this cylinder a Fleuss-type gage tube; the free end of this tube is connected to gage-valve connection of the apparatus. When carried with the team, the tube always is attached to the spare cylinder, so that when it is required it is necessary only to close the distressed man's gage valve, disconnect his gage tube from the cylinder and then connect the tube of the spare cylinder in its place. The gage valve and the spare cylinder valve are then opened, and the apparatus then functions in a normal manner with more than one hour's oxygen on hand. It is important to instruct the men to examine the apparatus to determine the cause of the oxygen loss.

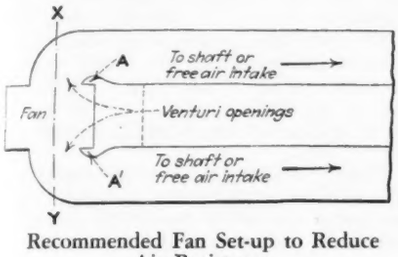
"This method is superior to taking oxygen from another member of the team, being quicker, and it does not involve disconnecting the apparatus of both men in case of an oxygen shortage. Total weight of the spare cylinder with tube attached is only 8 lb."

Spare Cylinder (Held by Teammate for Reasons of Clearness) Attached

Rescue Team Carrying Spare Oxygen Cylinder.

Airway Design Cuts Resistance

Much waste of power and decrease of volume occurs when air is turned through a right angle, and at the mines of the Pennsylvania Coal & Coke Corporation venturi openings (*AA'* in the sketch) are provided to reduce the resistance at these points. Velocities are so high that every care is necessary in helping the air make the turns. The illustration shows how this is done. A slight bulge is built in the airway near the fan to aid in turning the air without undue turbulence. These bulges have been found to increase the equivalent area of the inlet from 62 to 90 per cent,



Recommended Fan Set-up to Reduce Air Resistance

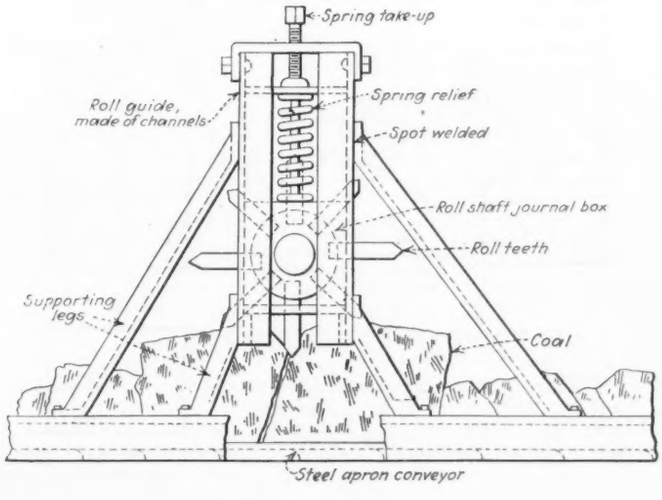
or about 45 per cent, thus greatly reducing resistance. For efficiency, bearings should be located outside the airway at *XY*, the line between them being the center line of the fan shaft. Bearings located within the fan housing greatly increase turbulence.

Motorless Crusher on Conveyor

In mechanical mining, large lumps of coal are so readily loaded that many of them reach the preparation plant and pass on to the railroad car with little reduction in size, even though the coal may be fairly soft. As the lumps frequently cause operating difficulties, they must be reduced by hand or some other means. One mine in Pennsylvania has solved the problem by installing a motorless crusher on the apron-type conveyor which transports the coal. This crusher acts automatically, the roll and teeth being turned by the movement of the coal on the conveyor in the same fashion as a turnstile.

Details of construction and operation are given in the accompanying sketch. Bearing ends are turned on the roll, which is drilled to receive pointed teeth of heavy forged steel. Local requirements will determine the number, size and spacing of the teeth. The roll is supported in journals mounted in a channel-type guide, which in turn is held in place over the conveyor by channel or angle legs. Many of the joints may be made by spot welding. The spring mechanism relieves the conveyor of the effects of extreme pressure. Obviously, this equipment is not adapted to breaking down hard coal.

This Crusher Takes a Leaf From Turnstile Operation



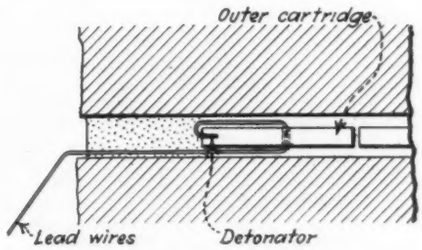
On the Ball

With a pitcher, it's the stuff on the ball that counts. A good pitcher must have the necessary muscular coordination to place the ball where he wants it, but that is only half the story. Knowledge of the capabilities and weaknesses of the opposing batters is every bit as important. Similarly, the operating man who expects to get along needs something on the ball—in this case, also, a thorough knowledge of the more routine aspects of his job as well as the ability to find an immediate and money-saving solution for those unexpected problems that come up from day to day. Consult these pages for tried and proved operating, electrical and safety hints, and also send in your contributions. *Coal Age* will pay $5 or more each for acceptable ideas. A sketch or photograph may make them clearer.

Correcting the Record

Expressing his agreement with the comments of George S. Rice, chief mining engineer, U. S. Bureau of Mines, on the method of arranging detonators and leads adopted by the Susquehanna Collieries Co. to reduce misfires, as set forth in the March *Coal Age*, p. 101, Clyde G. Brehm, supervisor of safety and compensation for the company, points out that the original description of the system (December, 1932, p. 447) was in error in stating that the primer is placed at the bottom of the shothole.

In detailing the correct method of charging holes, Mr. Brehm states that "the men are carefully instructed to make a small hole of the correct diameter with a wooden needle in the axis of the *last* cartridge to be pushed into the borehole. This small hole is so positioned that the detonator will *point inward* when the cartridge is in place. Leads are taken back on the cartridge toward its further end and are passed through another hole, pierced by the same needle, through the stick of explosive, from which they pass without kinks to the mouth of the borehole." This method is shown in the accompanying sketch, submitted by Mr. Brehm.



Arrangement of Detonator and Leads Adopted by the Susquehanna Collieries Co.

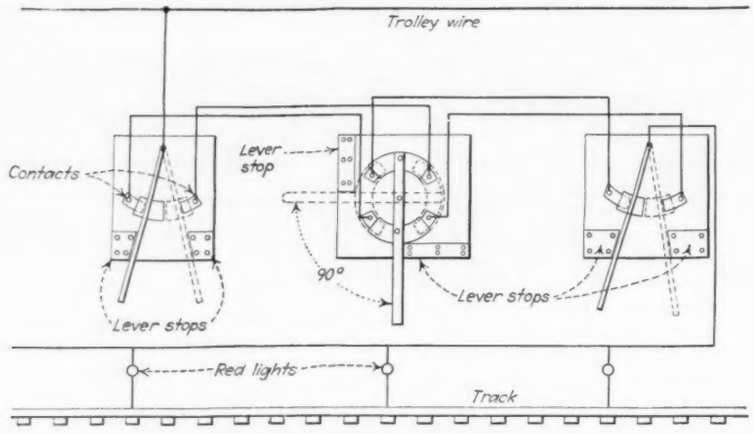
Inclosing Cartridges in Tube Prevents Misfires

With the objective of securing complete detonation of the entire charge when more than one cartridge is used, French mining officials have been testing out the use of paper tubes in which all the cartridges are inclosed before they are inserted in the hole. This is done to prevent dust from getting between the cartridges, which may result in one or more being left unexploded. Results over a period of six months have been highly satisfactory, reports R. E. Ward, in a paper read before the Midland Institute of Mining Engineers (England) a few weeks ago. No unexploded cartridges were found during the test period, whereas they were a frequent occurrence before the new system was tried out. French regulations require that the primer be placed at the outside end of the charge, with the detonator in contact with the stemming.

Haulage Signal System

Where several locomotives are required to operate over the same stretch of track, some type of signal system is desirable in order to assure the respective motormen a clear road. As an example of such a system, Robert Andrews, Morley, Tenn., offers the type shown in the sketch, which is hand-operated and can be built at low cost.

When the motorman wants to travel the section controlled by the lights, he pulls up to one of the switches and, provided a red light is not already showing, throws the switch handle over, thereby lighting up the red lights. He is then free to enter the zone. When the locomotive clears the zone, the switch handle at the exit is thrown over, cutting off the red lights and permitting other locomotives to enter.



Diagrammatic Sketch of Signal System

If, through chance, two switches be thrown at the same time, the red lights will not come on, thus eliminating danger of collision or interruption of haulage.

Discarded Locomotive Tires Make Sand Stove

With the limited storage space available, the Four Seam Coal Corporation, Diablock, Ky., frequently found it necessary to dump wet sand from the river directly into the sand dryer, thus decreasing the life of the stove. In a search for equipment with a longer life under this condition, welding was called on for the construction of a dryer embodying the following material: twelve discarded locomotive tires, one used bevel gear from a mining machine, a discarded car axle, 12 ft. of 6-in. pipe and the necessary $\frac{3}{8}$- and $\frac{1}{8}$-in. sheet iron.

In building the dryer, according to Lloyd G. Fitzgerald, superintendent, the first tire was buried in the concrete foundation. Fourteen inches was cut from the next two tires and a door was made for the removal of ashes. The next tire was then placed and grates made from a 2-in. car axle were welded in place. A band of $\frac{3}{8}$-in. sheet iron, through which 1x1$\frac{1}{2}$-in. holes were cut, was welded onto the flange of this tire. This band supports the hopper and allows the dry sand to escape.

The door of the stove was placed in the top to eliminate burnouts experienced with other types of stoves. While this makes starting a fire inconvenient, this drawback is offset by the fact that the fire keeps for several hours when the bottom draft door is closed. The stove is fired with inferior lumps taken off the trips while the locomotives are being sanded. The large firebox makes firing necessary only once or twice a shift.

Locomotive Tires Form the Backbone of This Sand Dryer

Safety Shotfiring Device

Frank H. Wilson, Beckley, W. Va., has developed the safety switch shown in the accompanying illustration to prevent accidents growing out of the presence of stray currents when firing shots electrically. The switch is strapped to the top of a timber close to the face, and the 15-ft. double-conductor cable is connected to the detonator wires. To fire the shot, the miner goes back to the firing station and connects his battery to the double-conductor cable leading to the switch. A strong pull on the latter completes the circuit to the detonator, as shown in figure, and the shot is fired.

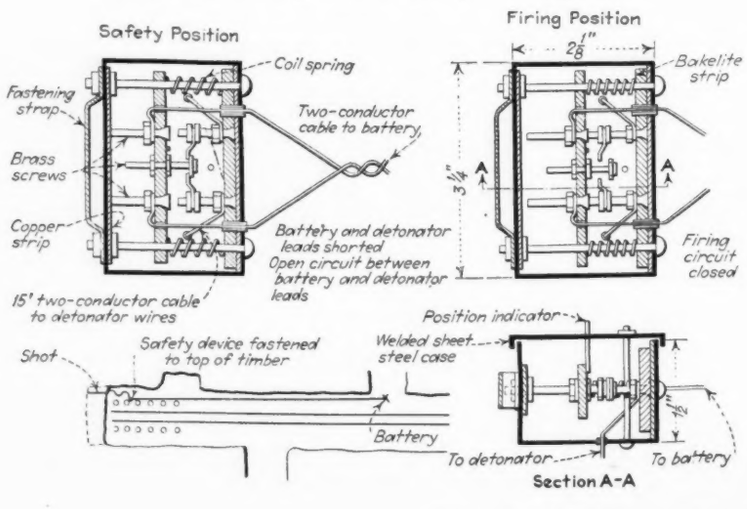
While connections are being made, the battery cable is shorted on a copper strip mounted in the switch case. The detonator cable also is shorted at the same time, as shown, and the circuit between the two cables is open, due to the action of the strong coil springs on the Bakelite strip on which the battery current contact and detonator cable shorting screws are mounted.

Disk Wheels Stop Breakage From Heating

When brake wheels are made with spokes, the heat induced by braking is slowly and irregularly carried away by the outside of the wheel and by the spokes; more rapidly by the former than by the latter. This causes the base of the spokes to fracture. Such cracks can be welded, and possibly if the weld is well peened, it will last for some time, because the shrinkage in the cooling of the weld will not cause it to break. However, better results will be obtained, according to the experience of J. F. MacWilliams of the Pennsylvania Coal & Coke Co., Cresson, Pa., if instead of a spoked wheel a disk wheel is used, which will the more rapidly and evenly dissipate the heat of braking. Moreover, as a disk wheel contains more metal, it has a great capacity for holding heat and, therefore, will not be rendered so hot by the energy generated in the application of the brake.

Welding tends to cause a piece of metal to twist out of shape, and when it is prevented from thus accommodating itself to the expansions and subsequent contractions, stress supervenes and breakage may occur. For this reason, peening of the weld must not be overlooked or slighted.

Construction and Operation of Safety Shotfiring Device



WORD from the FIELD

New Plant Construction

New contracts for topworks construction at various coal companies were reported as follows in May:

Anchor Coal Co., Highcoal, W. Va.; contract closed with the McNally-Pittsburg Mfg. Corporation for complete tipple rebuilding job, including main shaker screens for making four sizes and an additional loading boom; capacity, 350 tons per hour.

C. P. Calloway Coal Co., Cepece, W. Va.; contract closed with the Roberts & Schaefer Co. for Menzies hydroseparator for washing nut coal; capacity, 50 tons per hour.

Elmira Coal Co., Elmira, Mo.; contract closed with the United Iron Works Co. for all-steel headframe and preparation plant equipped with auxiliary screen and breaker, four-track double shaker screen for making slack, nut, egg and lump; rescreens; degradation and refuse conveyors, picking tables, loading booms, car retarders, and truck coal conveyor and bin; capacity, 250 tons per hour; to be completed Sept. 1.

Interstate Coal Co., Bonanza, Ark.; contract closed with the United Iron Works Co. for all-steel headframe and preparation plant equipped with five-track double shaking screen for making slack, pea, nut, egg and lump; rescreens, degradation and refuse conveyors, picking tables, loading booms and car retarders; capacity, 300 tons per hour; to be completed, Sept. 1.

New Upper Lehigh Coal Co., Upper Lehigh, Pa.; construction of a new breaker equipped with Chance cleaning equipment under way; capacity, 800 tons per day; to be completed Oct. 1.

Phelps-Dodge Corporation, Dawson, N. M.; contract closed with the Roberts & Schaefer Co. for Menzies hydroseparator for washing nut coal; capacity, 90 tons per hour.

Truax-Traer Lignite Coal Co., Kincaid, N. D.; contract closed with the McNally-Pittsburg Mfg. Corporation for complete tipple rebuilding job, including new shaker screen, Pittsburg adjustable two-roll breaker, conveyor and other equipment; capacity, 250 tons per hour.

Midland Stripping Under Way

Preliminary work for the construction of a new stripping plant for the Midland Electric Coal Corporation at Farmington, Ill., on the Minneapolis & St. Louis R. R., got under way in May. The contract for supplying stripping equipment and for building a complete preparation plant was let to the Marion Steam Shovel Co. The Allen & Garcia Co. are consulting and designing engineers for the latter.

Capacity of the preparation plant is 600 tons per hour, and it includes a dumping station, preliminary crusher, pendulum-hung shaker screens, shaking picking tables, pan-conveyor loading booms for lump and egg, mixing conveyor, two Simon-Carves washers for 4x0-in. coal, dewatering screens, a heat dryer for the ½x0-in. washed coal, and a complete crushing plant. Seven sizes will be produced: 6-in. lump, 6x4- and 4x2-in. egg, 1¼x¾-in. nut, ¾x½-in. pea, and ½x$\frac{1}{16}$-in. slack. Marion Steam Shovel Co. is furnishing a 20-yd. stripping shovel and an electric coal-loading shovel. The plant will be in operation in September or October.

New Mine Power Plants

Ben Franklin Coal Co. of West Virginia is now erecting a new power plant at its Moundsville (W. Va.) mine. Equipment includes two 600-hp. boilers and two 750-kw. turbo-generators. J. D. McQuade, mechanical engineer, is in charge of construction.

Jewell Ridge Coal Corporation is now erecting a new power plant at Richlands, Va., to serve the Jewell Ridge mine. Equipment will consist of Union Iron Works boilers, two 1,000-kw. Westinghouse turbo-generators and stoker firing equipment. Slack coal will be used as fuel, and the company expects to save one-half of its present power cost.

Equipment for the Lillybrook Coal Co. power plant, at Lillybrook, W. Va., reported in the May *Coal Age*, p. 167, includes the following: two 750-kva., 600-kw., 60-cycle, 2,300-volt General Electric generators direct-connected to 900-hp. Skinner "Universal Unaflow" engines; two 507-hp. Babcock & Wilcox Type H Stirling water-tube boilers; and two 507-hp. forced-draft Detroit stokers. L. I. Snodgrass Co., Cincinnati, Ohio, is in charge of construction.

Glen Alden Coal Co. has purchased the following equipment to add to the capacity of its Nanticoke power plant, Plymouth, Pa.: one Babcock & Wilcox 668-hp. Stirling boiler, two-drum economizer, and a Bailey water-cooled furnace.

Research Foundation Voted

With an eye to the growing demand for a smokeless fuel for use in the state, the Board of Regents of the University of Utah authorized a Research Foundation on May 12 to be devoted largely, though not entirely, to research on Utah coal. The board provided for the early appointment of a committee to undertake organization of the foundation.

Ohio Rate Cuts Prohibited

Restoration of intrastate freight rates on coal from eastern and southern Ohio mines to northern Ohio destinations to the levels prevailing prior to Aug. 1, 1932, was ordered by the Interstate Commerce Commission in a decision handed down in Docket 25,566 and related cases on May 6. The Commission, however, refused the petition of western Pennsylvania carriers and operators that the differential be restored by reducing interstate rates. The case grew out of the action of the Ohio Public Utilities Commission in reducing rates from Ohio origin points 29c. a ton on August 1, 1932. This, together with the Ohio commission's abrogation of the 6c. surcharge on intrastate shipments increased the differential between Ohio districts and western Pennsylvania from 10 to 45c. per ton. The Interstate Commerce Commission also directed that rates on coal from mines on the Pittsburgh & West Virginia R.R. should not exceed those from other mines in the Pittsburgh district.

A suit to enjoin enforcement of the Commission's order was begun later in the federal court at Columbus by the Ohio commission and the Wheeling & Lake Erie Ry. Arguments were scheduled for June 3 by the court.

Central Cleaner Being Built

The Acme Coal Cleaning Co., Pittsburgh, Pa., is building a central cleaning plant on the Pittsburgh & West Virginia R.R., at Avella, in western Pennsylvania. Cleaning equipment consists of a 13½-ft. Chance cone. The plant will have a cleaned-coal capacity of 400 tons per hour, and over-all capacity of 550 to 600 tons per hour; is equipped to receive raw mine-run or 6-in. resultant, and to ship 6-in. hand-picked lump, Chance-cleaned 4x6-in. egg, 2x4-in. egg, 1¼x2-in. nut, and ¼x1¼-in. pea, and dry uncleaned ¼-in. slack. Joseph Pursglove, Jr., engineer, Powhatan Mining Co., Powhatan, Ohio, is president of the company.

New Automatic Heat Plan

Weston Dodson & Co., Inc., Bethlehem, Pa., at a meeting with anthracite retailers in Lehigh and Northampton counties last month, offered to put a complete sales and service organization for automatic anthracite burning equipment into the two counties and told the assembled dealers that while it would work to some extent independently it would accept any leads supplied by the dealers and share with them such profits as resulted. The plan was proposed, according to the company, to supply the functions which the organization of the average retailer does not embrace, and thus permit him to compete with oil-burner companies.

National Industrial Recovery Bill Offered; Coal Legislation Plans Sidetracked

THE federal administration's two-year emergency program for restoring sick industry was offered to Congress on May 17, accompanied by a special message from President Roosevelt urging its enactment as part of the national campaign to put people to work. Title I of the bill provides for cooperative action by industry and trade and between such groups and labor under government sanctions and approval, and authorizes the President to take the initiative where industry itself fails to act. Action under the provisions of this title are exempt from the provisions of the anti-trust laws. Title II of the bill provides for a $3,300,000,000 federal public works program.

After a squabble in the House of Representatives over methods of raising revenues necessary to launch the program contemplated under Title II, administration forces took control of the situation and the bill was passed in the lower house on May 26 by a vote of 323 to 76. A revolt in the Senate committee on finance on June 2 resulted in the elimination of the licensing provisions by a majority of the committee and inclusion of a section empowering the President to embargo foreign imports. Senator Harrison, chairman of the committee, and Senator Wagner, who introduced the bill, declared that the fight to restore the bill to its original form would be carried to the floor of the Senate.

Business leaders have greeted the bill with mixed emotions. Although the provisions for self-government by industry are in accord with recommendations made by spokesmen for the Chamber of Commerce of the United States and the National Association of Manufacturers, the sections dealing with labor have created uneasiness among open-shop industries and this uneasiness has not been lessened by the announcement of the American Federation of Labor that it would launch a new organization drive among non-union workers. At a meeting called by the National Association of Manufacturers at Washington June 3, the representatives present proposed the following amendments to the bill:

1. Inclusion of permissive authority for a Presidential embargo on imports when necessary "to prevent the failure of the act due to excessive importations resulting from increased costs of domestic production and manufacture."
2. Elimination of the licensing section.
3. Modification of the labor provisions "to make it clear that there is neither the intention nor the power to reorganize present mutually satisfactory employment relations, nor to establish any rule which will deny the right of employers and employees to bargain either individually or collectively in such form as is mutually agreeable to them."
4. Expansion of the administrative machinery so that industries may have continuing representation in the administration of the act.
5. Fullest utilization of domestic goods in expenditures of public funds under Title II.
6. Substitution of a single excise tax, except on food products, low-priced clothing and drugs, for the revenue provisions of the House bill.

"Unless these provisions can be incorporated in the bill, in substance," concluded the resolution, "the industries of this country cannot give their whole-hearted support to the measure. There are too few advantages to industry in the bill to justify us in submitting to the restrictions and penalties imposed upon us."

Following the meeting at which this resolution was adopted by an overwhelming majority, General Hugh S. Johnson, the President's choice for administrator under the proposed act, met with a special committee of bituminous operators at the offices of the National Coal Association for a three-hour discussion of the bill. This committee, chosen at a meeting of over 100 operators presided over by C. E. Bockus, president of the National Coal Association, had the following personnel:

Charles O'Neill, vice-president, Peale, Peacock & Kerr, Inc., chairman; John R. Doolin, executive secretary, Utah Coal Producers' Association; E. M. Douthat, general manager, Majestic Coal Mining Co.; Wm. Emery, Jr., president, Cambridge Collieries Co.; J. D. Francis, vice-president, Island Creek Coal Co.; C. G. Hall, general manager, Walter Bledsoe & Co.; George B. Harrington, president, Chicago, Wilmington & Franklin Coal Co.; H. R. Hawthorne, vice-president, Pocahontas Fuel Co.; E. C. Mahan, president, Southern Coal & Coke Co.; Hugh Morrow, president, Sloss-Sheffield Steel & Iron Co.; J. D. A. Morrow, president, Pittsburgh Coal Co.; T. C. Mullins, president, Sunlight Coal Co.; W. L. Robison, president, Youghiogheny & Ohio Coal Co.; John A. Templeton, president, Linton-Summit Coal Co.; R. C. Tway, president, R. C. Tway Coal Co.; C. W. Watson, receiver, Elk Horn Coal Corporation; R. A. Young, president, Arkansas-Oklahoma Coal Institute.

The Colorado and New Mexico Coal Operators' Association wired its opposition to any provision which would force producers in those states to recognize union labor. The organization also declared that stabilization in the coal industry would be difficult without comparable adjustments in the oil and natural-gas industries.

Enactment of the National Industrial Recovery bill will mean the sidetracking of active consideration of legislative proposals made a few weeks ago by operators in the Illinois and Indiana groups, who conferred with Secretary of Labor Perkins and Secretary of the Interior Ickes early in May, and by a small group from western Pennsylvania. The nub of these proposals was wage stabilization. Enactment of the bill also will mean the indefinite postponement of any administration program for coal legislation, according to reports from authoritative sources. Up to the time the general industrial bill was submitted, coal legislation was said to be very much in the picture being developed by the Roosevelt administration.

The first section of Title I of the bill declares the existence of a national emergency and announces the policy of Congress to remove obstructions to the free flow of interstate commerce and "to promote the organization of industry for the purpose of cooperative action among trade groups, to induce and maintain united action of labor and management under adequate government sanctions and supervision, to eliminate unfair competitive practices, to reduce and relieve unemployment, to improve standards of labor, and otherwise to rehabilitate industry and to conserve natural resources." This last phrase specifically mentioning natural resources was inserted, it is said, at the suggestion of General Johnson.

Section 2 empowers the President to appoint such agents as he may desire to carry out the purposes of the act, to delegate his authorities of administration and to establish "an industrial planning and research agency." The section also provides that Title I shall continue in effect for two years after its enactment unless terminated sooner by Presidential proclamation.

Under section 3, industrial groups may

"I recommend that . . . Congress provide for the machinery necessary for a great cooperative movement throughout all industry in order to obtain wide re-employment, to shorten the work week, to pay a decent wage for the shorter week and to prevent unfair competition and disastrous overproduction. Employers cannot do this singly or even in organized groups, because such action increases costs and thus permits cutthroat underselling by selfish competitors unwilling to join in such a public-spirited endeavor.

"One of the great restrictions upon such cooperative efforts up to this time has been our anti-trust laws. They were properly designed as the means to cure the great evils of monopolistic price fixing. They should certainly be retained as a permanent assurance that the old evils of unfair competition shall never return. But the public interest will be served if, with the authority and under the guidance of government, private industries are permitted to make agreements and codes insuring fair competition. However, it is necessary, if we thus limit the operation of anti-trust laws to their original purpose, to provide a rigorous licensing power in order to meet rare cases of non-cooperation and abuse. Such a safeguard is indispensable."

—From the message of President Roosevelt on the National Industrial Recovery bill, May 17, 1933.

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apply to the President for approval of fair practice codes. Such approval is contingent upon a showing that: (1) the applicant groups or associations are truly representative of their industries and impose no unreasonable restrictions on membership; (2) the codes do not foster monopolies or oppress or discriminate against small enterprises. The President may impose such conditions as he deems necessary for the protection of consumers, competitors and employees and may authorize such exceptions to and exemptions from the code as he sees fit to carry out the purposes of the act.

Approval of the code makes it binding upon the industry or subdivision thereof which it covers. Any violation of the standards so set up is made "an unfair method of competition" carrying a penalty of not more than $500 for each offense. Federal district courts are vested with jurisdiction to prevent and restrain violations of any code approved under the act. Where no code has been set up on the initiative of industrial groups, the President, upon complaint or upon his own motion and after a public hearing, may prescribe such a code.

Section 4 authorizes the President to enter into and/or to approve voluntary agreements between and among persons engaged in a trade or industry, labor organizations and trade associations when such agreements are consonant with the purposes of the act. He may also require enterprises engaged in interstate commerce and subject to the act to take out individual licenses and prescribe the terms under which such licenses shall be issued. Where such licensing provisions have been established, no enterprise shall engage in interstate commerce in the industry or trade covered without first procuring such license. After due hearing, the President may revoke any licenses, and his decision shall be final. Violation of the licensing provisions or engaging in business without a license is subject to a fine of not more than $500, imprisonment for not more than six months or both fine and imprisonment. Each day such violation continues constitutes a separate offense.

During the time Title I is in effect and for 60 days thereafter, says section 6, "any code, agreement or license approved, prescribed or issued and in effect under this title and any action complying with the provisions thereof taken during such period, shall be exempt from the provisions of the anti-trust laws of the United States."

Section 6 specifies that no trade or industrial group or association may enjoy the benefits of the act until it files a statement of its purposes and activities in such form as the President may prescribe. The President also is authorized "to prescribe rules and regulations designed to insure that any organization availing itself of the benefits of this title shall be truly representative of the trade or industry or subdivision thereof represented by such organization." He may use the Federal Trade Commission as an investigating agency.

By the terms of section 7, every code, agreement or license under the act shall contain the following provisions: "(1) That employees shall have the right to organize and bargain collectively through representatives of their own chossing; (2) that no employee and no one seeking employment shall be required as a condition of employment to join any organization or to refrain from joining a labor organization of his own choosing; and (3) that the employers shall comply with the maximum hours of labor, minimum rates of pay and other working conditions approved or prescribed by the President."†

The President, "so far as practicable," shall afford every opportunity to employers and employees in any industry or subdivision where conditions (1) and (2) of the preceding paragraph prevail to reach an understanding on wages, hours and working conditions by mutual agreement. Where no such mutual agreement has been reached and approved by the President, he may investigate labor policies, practices, rates and working conditions and, on the basis of such investigation, prescribe a limited code of fair competition, fixing maximum hours, minimum rates and other working conditions. "The President may differentiate according to experience and skill of the employees affected and according to the locality of employment; but no attempt shall be made to introduce any classification according to the nature of the work involved which might tend to set a maximum as well as a minimum wage."

Finally, under section 9 (section 8 has reference to the farm act of May 12) the President may prescribe such rules and establish such fees as he deems necessary. Any violation of any rule or regulation so prescribed shall be punishable by fine not exceeding $500, imprisonment not exceeding six months or by both fine and imprisonment. The President from time to time may also cancel or modify any order, approval, license, rule or regulation issued under the act.

†In the House bill, these provisions were changed to read as follows:

"(1) That employees shall have the right to organize and bargain collectively through representatives of their own choosing, *and shall be free from the interference, restraint or coercion of employers of labor, or their agents, in the designation of such representatives or in self-organization or in other concerted activities for the purpose of collective bargaining or other mutual aid or protection;* (2) that no employee and no one seeking employment shall be required as a condition of employment to join any *company union* or to refrain from joining a labor organization of his own choosing."

The additional matter in the House bill is indicated by italics. There was no change in the language of clause (3).

Carriers Attack Lake Rates

Modification of the 1927 lake cargo decision to limit application of rates on bituminous coal to shipments actually moving to the Head of the Lakes and to remove from schedules all destinations east of Mackinac and Sault Ste. Marie was requested by the principal Eastern trunk lines in a petition submitted to the Interstate Commerce Commission on May 23. Briefs in opposition were filed by the Eastern Ohio Coal Operators' Association, Western Pennsylvania Coal Traffic Bureau, American Steamship Co. and the Steel Co. of Canada, Ltd.

Model Home Burns Anthracite

The "Home of Tomorrow," equipped with a new-type kitchen range and a new automatic furnace fired with chestnut, which also can be used for refrigeration and air conditioning, was opened at Merion, Pa., last month by the Philadelphia & Reading Coal & Iron Co., Pottsville, Pa. The range, based upon a Swedish invention, is said to operate on the "fireless cooker" principle. Completely insulated, the unit is cold to the touch except at the points where heat is needed. A built-in water heater delivers water at the boiling point through a spigot.

Among the features of the new furnace are automatic coal feed and ash removal, thermostatic control and adaptability to either steam, hot water or hot-air heating systems. The refrigeration unit uses steam as the refrigerating medium and can be used to operate certain types of refrigerators and also to furnish cold or hot water from all faucets in the house, according to reports. When a house is equipped with a hot-air heating system, the air-conditioning unit can be used either for heating or cooling the air after it is washed and dried.

Coming Meetings

Illinois Mining Institute; summer meeting and annual boat trip, St. Louis, Mo., and return, June 9-11.

National Retail Coal Merchants' Association; convention and exposition, Grand Rapids, Mich., June 12-15.

National Coal Association; annual meeting, June 15-17, Chicago; annual dinner, June 16.

American Society Heating and Ventilating Engineers; semi-annual meeting, Hotel Statler, Detroit, Mich., June 22-24.

American Society Mechanical Engineers; semi-annual meeting, Palmer House, Chicago, June 26-30; fuel sessions, June 26 and 27.

American Society for Testing Materials; annual meeting, June 26-30, Chicago.

Ohio Coal Conference; annual meeting, July 10-12, Cedar Point, Ohio.

Mining Society of Nova Scotia; annual meeting, July 11-12, Sydney, N. S.

Kentucky State-Wide First-Aid and Mine-Rescue Meet, Hazard, Ky., Aug. 12.

Obituary

EDWARD BRENNAN, 84, vice-president, Ashland Coal & Coke Co., Ashland, W. Va., and the Majestic Collieries Co., Majestic Ky., died at his home in Shamokin, Pa., May 8. Mr. Brennan was at one time a superintendent for the Susquehanna Collieries Co. and an independent anthracite operator.

FRANCIS H. BLATCH, vice-president, Wilmot Engineering Co., and for many years prominent in the development of coal-cleaning machinery and equipment, died at Hazleton, Pa., May 14.

Both East and West Set Plans in Motion For District Selling Agencies

PLANS for the formation of additional district bituminous sales agencies went forward rapidly in May, with prospects that several will begin formal operations in the immediate future. Appalachian Coals, Inc., the forerunner of those now in process of organization, held a meeting of sales officials in Cincinnati, Ohio, May 1, and on May 24 the stockholders elected a slate of 27 directors, who in turn chose the following officers: president, James D. Francis, vice-president, Island Creek Coal Co., Huntington, W. Va.; vice-president, E. C. Mahan, president, Southern Coal & Coke Co., Knoxville, Tenn.; treasurer, T. J. Davis, Cincinnati; secretary and assistant treasurer, R. E. Howe, president, Premier Coal Co., Knoxville, Tenn.

At a meeting of the central Pennsylvania organization committee, April 27, it was announced that a charter for Eastern Coals, Inc., had been obtained. Three subcommittees were appointed to study preliminary organization problems, as follows: marketing committee, to analyze available data on distribution; mine rating committee, to report on an appropriate plan for determining mine capacity; and a coal classification committee to draw up an appropriate classification plan.

Western Pennsylvania producers, at a meeting in Pittsburgh, Pa., May 2, appointed a committee of three engineers (S. A. Taylor, John M. Rayburn and Benjamin F. Hoffacker) to draw up an organization plan. The engineers submitted a tentative plan later in May, and it will serve as the basis for actual organization work.

Northern West Virginia organization committees continued their efforts to sign up the 15,000,000 tons (1931 production basis) set as the deadline for actual operation of Northern West Virginia Coals, Inc., and reported encouraging progress.

Stockholders representing 75 per cent of the tonnage in Ohio (Hocking field excepted) and the northern Panhandle of West Virginia elected directors for Northern Coals, Inc., at a meeting in Cleveland, Ohio, May 31. Officers also were chosen on the same day as follows: president, William Emery, Jr., president, Cambridge Collieries Co.; R. L. Ireland, Jr., vice-president, Hanna Coal Co.; secretary-treasurer, E. S. Willard, general manager, United States Coal Co.; assistant secretary-treasurer, D. F. Hurd, secretary, Eastern Ohio Coal Operators' Association. Committees were named to work out price schedules and classification problems, and it was expected that the agency would be in operation before June 10.

Organization of the Smokeless Coal Corporation was formally approved at a general meeting of southern West Virginia low-volatile operators held at White Sulphur Springs, W. Va., May 23. Details will be worked out at a later meeting on June 9-10, by which time it is expected that 75 per cent of the low-volatile tonnage will be signed up.

Thirty-seven western Kentucky producing companies were represented at a meeting at Madisonville, Ky., May 23, to discuss the organization of a selling agency, and approved in principle the plans of the organization committee. The delegates voiced the opinion that 90 per cent of the field tonnage should be signed up before formal organization should be undertaken, and adjourned until June 6.

Initial steps were taken for the formation of Alabama Coals, Inc., at a meeting at Birmingham, May 11, under the auspices of an organization committee composed of H. T. DeBardeleben, president, DeBardeleben, Coal Corporation; C. S. Bissell, president, Black Diamond Coal Mining Co.; Horace Hammond, president, Alabama By-Products Corporation; S. L. Yerkes, Grider Coal Sales Agency; D. A. Thomas, president, Montevallo Coal Mining Co.; and H. M. Brooks, vice-president, Alabama Fuel & Iron Co. A second meeting was held on May 29, and it is expected that the agency will be in operation before the end of June.

Colorado and New Mexico operators considered a sales agency at a meeting in Denver, Colo., a few weeks ago, and voted to draw up a plan of organization.

Mechanically Loaded Tonnage Declines in 1932

Production of coal by "mechanized mining" underground dropped to 35,817,000 net tons in 1932, a decline of 11,745,000 tons, or 24.7 per cent, from the 1931 total of 47,562,000 tons, according to figures compiled by the U. S. Bureau of Mines. This compares with a drop of 20 per cent in the total bituminous output of the country. More than half the decrease took place in Illinois as a result of labor troubles during the year, and when this state is excluded mechanical mining shows a decline of only 18 per cent, against a drop of 21 per cent in hand-loaded tonnage. The 1932 mechanized tonnage was 11.7 per cent of the United States total, a drop of 0.7 per cent from the 1931 total of 12.4 per cent.

In comparison with 1931, the number of mechanical loaders (mobile loaders, scrapers, duckbills and other self-loading conveyors) decreased from 894 to 835, while the number of pit-car loaders declined from 3,428 to 3,112. The number of mines using hand-loaded face conveyors decreased from 152 to 136. Of the 1932 tonnage handled by machines, mobile loaders accounted for 41.4 per cent; scrapers for 3.2 per cent; pit-car loaders for 35.1 per cent; other conveyors, including self-loading types, 20.3 per cent.

Comparative outputs of the various types of machines in 1931 and 1932 were as follows:

	1931, Tons	1932 Tons
Mobile loaders	19,407,000	14,825,000
Scrapers	1,471,000	1,132,000
Duckbills and other self-loading conveyors	1,811,000	1,630,000
Total	22,689,000	17,587,000
Pit-car loaders	19,172,000	12,590,000
Other hand-loaded conveyors	5,701,000	5,640,000
Grand total	47,562,000	35,817,000

Coal-Mine Fatalities Drop

Coal-mine accidents caused the deaths of 34 bituminous and 14 anthracite miners in April, 1933, according to information furnished the U. S. Bureau of Mines by state mine inspectors. This compares with 45 bituminous and 23 anthracite fatalities in March, and 49 bituminous and 33 anthracite deaths in April, 1933. The death rate at bituminous mines dropped to 1.74 in April, against 1.90 in March, while the anthracite death rate decreased to 4.84, as compared with 5.09 in March. Comparative figures are shown in the following table:

	April, 1933	March, 1933	April, 1932
BITUMINOUS MINES			
Production, 1,000 tons	19,523	23,685	20,300
Fatalities	34	45	49
Death rate per 1,000,000 tons	1.74	1.90	2.41
ANTHRACITE MINES			
Production, 1,000 tons	2,891	4,519	5,629
Fatalities	14	23	33
Death rate per 1,000,000 tons	4.84	5.0	5.86

Comparative fatality rates for the first four months of 1933 and 1932, by causes, are given in the following table:

FATALITIES AND DEATH RATES AT UNITED STATES COAL MINES BY CAUSES*

Cause	Bituminous: Number Killed	Bituminous: Killed Per Million Tons	Anthracite: Number Killed	Anthracite: Killed Per Million Tons	Total: Number Killed	Total: Killed Per Million Tons
January - April, 1932						
Falls of roof and coal	177	1.632	56	3.054	233	1.838
Haulage	51	.470	15	.818	66	.520
Gas or dust explosions:						
Local explosions	2	.019	....	.....	2	.016
Major explosions	44	.406	....	.....	44	.347
Explosives	5	.046	7	.382	12	.095
Electricity	13	.120	3	.164	16	.126
Machinery	6	.055	1	.055	7	.055
Surface and miscellaneous	27	.249	11	.600	38	.300
Total	325	2.997	93	5.073	418	3.297
January - April, 1933						
Falls of roof and coal	124	1.273	42	2.711	166	1.470
Haulage	41	.421	10	.645	51	.452
Gas or dust explosions:						
Local explosions	4	.041	7	.452	11	.098
Major explosions	....	.....	....	.....	....	.....
Explosives	8	.082	3	.194	11	.098
Electricity	10	.103	2	.129	12	.106
Machinery	4	.041	....	.....	4	.035
Surface and miscellaneous	13	.133	13	.839	26	.230
Total	204	2.094	77	4.970	281	2.489

*All figures are preliminary and subject to revision.

Anthracite Wage Conference Called Off; Ohio Suspension Ends

AT the request of Secretary of Labor Perkins, the joint conference of anthracite operators and miners which convened in Philadelphia, Pa., April 19, to consider the operators' request for a wage reduction, adjourned April 26 without setting a date for resumption. Secretary Perkins requested the adjournment for 30 days until legislation dealing with hours of labor and possible improvement of financial returns could be worked out. The operators acceded to the request with reluctance, and held that there was little use of seeking a resumption.

One result of the postponement of negotiations was the growth of a feeling that widespread closing of high-cost operations would be the order of the day. Following out this belief, the Glen Alden Coal Co. closed eight of its collieries indefinitely on May 1. In the southern field, civic leaders, legislators and citizens began a vigorous campaign early in the month for a federal investigation into closings in that region.

A number of attempts were made to effect a resumption of negotiations, but without results. Charles Dorrance, president, Penn Anthracite Mining Co., in newspaper advertisements on May 1, asked that union, operator, railroad and retail representatives get together to arrive at a solution involving an adjustment of mine and retail prices, wage scales and freight rates. In reply, Thomas Kennedy, Hazleton, Pa., international secretary-treasurer, United Mine Workers, declared that the anthracite situation should be allowed to clarify itself in the light of application of federal legislation. Another attempt to call a conference, made by C. P. Morrell, president, Royal Fuel Co., Morristown, N. J., was rejected by John L. Lewis, president of the miners' union, and the situation was further complicated by a practically unanimous vote against a reduction by members of District 1.

The anthracite region also was the scene of several local disturbances in May. Pickets stopped work at the Jeanesville No. 5, Dick's and Yorktown strippings, near Hazleton, May 11, as a protest against shipping the coal to another breaker for preparation. Twenty-four hundred employees at the No. 6 and No. 7 operations of the Susquehanna Collieries Co., Nanticoke, Pa., returned to work May 17 after a strike of two weeks in protest against the policy of laying off enough men to allow full-time daily work for the remainder. The grievance was submitted to arbitration.

Work was resumed at the Gaylord colliery of the Kingston Coal Co., Kingston, Pa., May 23, after a strike in protest against resumption at Gaylord breaker without resumption at the Gaylord shaft. The Kehoe-Berge mine at Duryea, Pa., was the target of picketing by adherents of the United Mine Workers, who declared that the operation was paying less than the union scale. Officials of the West End Coal Co., which started up the preparation plant on May 25 to prepare coal from strippings and rock banks were attacked by pickets protesting against the alleged employment of non-union men on these projects. Conferences to iron out the difficulties began in Scranton, May 27.

Ending a suspension which began on May 17, southern Ohio operators and miners' representatives agreed on May 31 to submit their differences over a new wage scale to a board of arbitration, which is to hand down a temporary scale on or before June 15, to remain in effect until federal legislation is passed or a state-wide agreement is adopted, provided this takes place in 60 days; otherwise, either party has the right to request a further conference. In the Tuscarawas field, miners and operators split over the operators' request for a scale embodying $3.10 for day labor, 35c. a ton for loading and 7c. a ton for cutting, the miners holding out for the old scale of $3.50 for day labor, 40c. for loading and 8c. for cutting.

Southern Wyoming operators and representatives of District 22 of the United Mine Workers ratified an extension of the existing wage agreement from May 1 to April 30, 1934.

While the Progressive Miners of America—denounced as communistic by its opponents—continued to push its struggle for supremacy in Illinois, Local 950 of the United Mine Workers, at a meeting in Springfield, May 26, formulated a petition calling for a state-wide convention of both factions to settle the dispute. Meanwhile, troops remained on duty in southern Illinois and in the Taylorville section.

The possibility of a strike in northern West Virginia was postponed for 30 days from June 1 at a meeting of operators and representatives of the United Mine Workers, held in Morgantown, May 31. The union's willingness to hold off action in the face of previous pronouncements against prevailing wage scales ($2.70 for day work and 22½c. for loading) was credited to a desire to await developments in Washington.

Missionary work by the United Mine Workers in central and western Pennsylvania was reported to be yielding surprising results in the number of men signing up with the union. In western Pennsylvania, the Communist National Miners' union was responsible for partial strikes and picketing at a number of operations in May.

Four miners were shot from ambush May 13 in a flare-up of the long-standing controversy between union adherents and operators in the Wilder field of Tennessee. All four were employed by the Fentress Coal & Coke Co., one of the major objects of attack by strikers.

As a result of a strike at the Standardville (Utah) mine of the Standard Coal Co., the first "pit committee" to be formed in the state in a number of years began operations in May. The strike was a peaceful affair, and grew out of allegations by the miners that the company had intended to cut wages. In settling the stoppage, rent on company houses was reduced 25 per cent during the summer months, and the company agreed to refrain from any general wage reduction.

Wage Increases Announced

Firing the first shot in what promises to be a battle against prevailing low wages in the bituminous industry, the board of directors of Appalachian Coals, Inc., on May 25 adopted a resolution to the effect "that the present selling prices of coal and, as a necessary result, the prices paid for labor, are too low, and that an increase of each resulting in a larger buying power is a necessary prerequisite to a return of prosperity." The board therefore recommended that all operators in the Appalachian field increase average wages for mine labor 10 per cent. Following out this recommendation, the Harlan County Coal Operators' Association announced on May 29 that its members would increase payrolls 10 to 15 per cent. This was followed, according to reports, by increases in the remaining seven southern high-volatile fields covered by Appalachian Coals, Inc., effective June 1.

The Pittsburgh Coal Co. announced a 10 per cent increase in wages on May 27, affecting 8,000 men, and bringing the loading rate up to 38½ to 49½c., against 35 to 46c. previously paid. Day men were raised to $3.80, with bonuses extra. Ten per cent increases also were announced by the Keystone Coal & Coke Co., Greensburg, Pa., affecting 1,000 men; Jamison Coal & Coke Co., Greensburg, affecting 1,200 men; Riverseam Coal Co., Booth, W. Va., and the Pulaski Anthracite Coal Co., Parrott, Va.

Personal Notes

A. J. ALEXANDER, formerly superintendent of the Mud Fork division, Island Creek Coal Co., has been appointed general manager of the Wells-Elkhorn Coal Co., with operating offices at Estill, Ky.

H. L. FINDLAY, vice-president, Youghiogheny & Ohio Coal Co., Cleveland, Ohio, has been elected president of the Carnegie Northern Fuel Co., organized last month by merging the Carnegie Dock & Fuel Co., Minneapolis, and the Northern Coal & Dock Co., St. Paul, Minn.

FRANK E. WOOD was elected president of the Carrs Fork Coal Co., operating two mines at Allock, Ky., in May. Other officers also were chosen, as follows: vice-president, W. J. CUNNINGHAM, president, Crummies Creek Coal Co., Crummies, Ky.; treasurer, O. R. MICHLEWAITE; secretary, A. C. W. BOWEN.

JAMES B. SMITH, San Francisco, Calif., president, Spring Canyon Coal Co., was reelected president of the Utah Coal Producers' Association at the annual meeting held last month. L. R. WEBER, president, Liberty Fuel Co., Latuda, Utah, was again chosen vice-president, and JOHN R. DOOLIN, Salt Lake City, was reelected secretary-treasurer.

J. C. MILLER, Ashland, Ky., formerly vice-president, has been elected president of the Nellis Coal Corporation, which succeeds the coal and coke department of the American Rolling Mill Co., Nellis, W. Va.

FRED LEGG, president, Logan & Kanawha Coal Co., Cincinnati, Ohio, is the new vice-president, and R. L. RICHARDSON, Ashland, is treasurer.

ARNOLD GRIFFITH, Excelsior Springs, Mo., was appointed chief inspector of mines for Missouri last month, succeeding FRANK G. FENIX, Joplin.

PRIESTLY TOULMIN, president, Lehigh Coal Co., Birmingham; WADE H. OLDHAM, Republic Steel Co., Thomas; and DARIUS THOMAS, president, Montevallo Coal Mining Co., Birmingham, have been elected to the board of governors of the Alabama Mining Institute.

J. J. SELLERS has been elected vice-president of the Virginia Iron, Coal & Coke Co., Roanoke, Va.

E. C. MATTOX, general manager of the Roundup Coal Mining Co., Roundup, Mont., has been elected vice-president of that company and the Sheridan and Megeath coal companies, of Wyoming.

W. F. PLACE, assistant vice-president, New York Central Lines, has been elected president of the Clearfield Bituminous Coal Corporation, Indiana, Pa. Mr. Place succeeds FRANK E. HERRIMAN, who retired a few weeks ago.

W. W. KEEFER, Pittsburgh, Pa., has been named executive head of the Pittsburgh Terminal Coal Corporation, succeeding Samuel Pursglove, of Cleveland, and, it is understood, will be formally elected president at the next directors' meeting.

FRANK H. WAGNER, general manager, Lehigh Valley Coal Co., Wilkes-Barre, Pa., was elected executive vice-president and general manager of the company on May 15. Mr. Wagner joined the Lehigh Valley organization as an engineer twenty years ago, and rose to the general manager's post a few years ago. Other changes in the list of officials last month arising out of the discontinuance of the Lost Creek division offices were as follows: JOHN PRICE, superintendent, Lost Creek division, continues in this capacity and also takes over the Hazleton division; SHELDON JONES, superintendent, Hazleton division, assigned to the general manager's office; HERBERT HEFFNER, Lost Creek division engineer, becomes land agent for the Hazleton-Mahanoy City division; HAYDEN OWENS, Hazleton division agent, becomes superintendent at Packer No. 5 colliery.

Anthracite Prices Cut

A reduction of $1 per ton on domestic sizes of anthracite was put into effect on May 1 by leading anthracite producers. The lower prices are designed to give consumers in the Eastern anthracite-burning territory the benefit of the maximum cut of $1 per ton granted to Chicago consumers a few weeks ago, and brings quotations on the various domestic sizes down to the following: grate, $5.75; egg $6; stove, $6.25; chestnut, $6; pea, $4.15. Prices on the junior sizes are unchanged at the following: buckwheat, $3.25; rice, $1.85; barley, $1.40.

One outstanding development in the Chicago market in May was the announcement of discounts by the Philadelphia & Reading Coal & Iron Co. that brought chestnut quotations down to a minimum of $4.55 per ton. While the base price is maintained at $8 per ton, the minimum of $4.55 is arrived at by deducting a seasonal reduction of $2, a special discount of $1.25 to reestablish anthracite in the market, and the regular discount of 20c. for payment within fifteen days. Comparable reductions were allowed by the company on other sizes.

Anthracite rail presidents met in New York May 17 to discuss the alleged failure of retailers to pass rate reductions on to consumers. The presidents also took up the question of meeting competition of foreign anthracite in the New England and Canadian markets, and on May 20 appointed a subcommittee of traffic officials to determine the necessity and extent of proposed reductions to accomplish this purpose.

Safety Contest Winners

Jeddo No. 7 mine, Jeddo-Highland Coal Co., Jeddo, Pa., and the Alloy mine, Electro-Metallurgical Co., Alloy, W. Va., respectively, led the anthracite and bituminous groups in the 1932 National Safety Competition for the "Sentinels of Safety" trophy awarded by *The Explosives Engineer*. Jeddo No. 7 mine ran up a total of 165,624 man-hours of exposure with but nine lost-time injuries causing 116 days of disability. Alloy mine showed a record of 225,687 man-hours with no lost-time injuries.

Industrial Notes

J. J. SNURE, formerly general manager, Valley Camp Coal Co., Wheeling, W. Va., and recently connected with the Black Mountain Coal Corporation, Kenvir, Ky., has been appointed sales engineer for the Portable Lamp & Equipment Co., Pittsburgh, Pa.

REPUBLIC STEEL CORPORATION, Youngstown, Ohio, has removed its Buffalo (N. Y.) district sales office to 475 Abbott Road.

BUCYRUS-ERIE Co., South Milwaukee, Wis., has acquired the drill business of the Armstrong Mfg. Co., and will manufacture and sell the Armstrong drills and bit sharpeners.

WOOD PRESERVING CORPORATION, Pittsburgh, Pa., has established an operating unit under the supervision of REAMY JOYCE and SHERMAN S. WATKINS, formerly of Joyce-Watkins Co., Chicago.

H. V. ERBEN, manager of the apparatus division, has been appointed manager of the switchgear sales division, central station department, General Electric Co., with headquarters at West Philadelphia, Pa. Mr. Erben succeeds J. W. UPP, retired after 32 years' service, though continuing in an advisory and consulting capacity.

INTERSTATE EQUIPMENT CORPORATION has removed its general offices from New York City to 18 West Jersey St., Elizabeth, N. J.

Contents, Coal Age for June, 1933

With which is consolidated "The Colliery Engineer" and "Mines and Minerals"

 Volume 38, No. 6

EDITORIAL STAFF: Sydney A. Hale, Editor; R. Dawson Hall, Engineering Editor; Ivan A. Given, L. C. McCarthy, Paul Wooton; J. H. Edwards and A. F. Brosky, Consulting Editors. Publishing Director, H. W. Clarke.

COAL AGE is published monthly on the 15th. $3 per year in the United States. Canada (including Canadian duty), $3.50. Central and South American countries, $4. Foreign subscription, $5, or 25 shillings. Single copies, 35 cents each. Entered as second-class matter, Oct. 14, 1911, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Printed in the U. S. A. Cable address: "McGrawHill, N. Y." Member A.B.P. Member A.B.C.

McGraw-Hill Publishing Company, Inc., 330 West 42d St., New York, N. Y.

Branch offices: 520 North Michigan Ave., Chicago; 883 Mission St., San Francisco; Aldwych House, Aldwych, London, W.C. 2; Washington; Philadelphia; Cleveland; Detroit; St. Louis; Boston; Greenville, S. C.

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